

Systematics, distribution and ecology of the snakes of Jordan

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> Abstract

The present study consists of both locality records and of literary data for 37 species and subspecies of snakes reported from Jordan. Within the past decade snake taxonomy was re-evaluated employing molecular techniques that resulted in reconsideration of several taxa. Thus, it is imperative now to revise the taxonomic status of snakes in Jordan to update workers in Jordan and the surrounding countries with these nomenclatural changes. The snake fauna of Jordan consists of 37 species and subspecies belonging to seven families (Typhlopidae, Leptotyphlopidae, Boidae, Colubridae, Atractaspididae, Elapidae and Viperidae). Families Leptotyphlopidae, Boidae and Elapidae are represented by a single species each, *Leptotyphlops macrorhynchus*, *Eryx jaculus* and *Walterinnesia aegyptia* respectively. The families Typhlopidae and Atractaspididae are represented by two and three species respectively. Species of the former genus *Coluber* were updated and the newly adopted names are included. Family Colubridae is represented by twelve genera (*Dolichophis*, *Eirenis*, *Hemorrhais*, *Lytorhynchus*, *Malpolon*, *Natrix*, *Platyceps*, *Psammophis*, *Rhagerhis*, *Rhynchocalamus*, *Spalerosophis* and *Telescopus*) and includes 24 species. Family Viperidae includes five genera (*Cerastes*, *Daboia*, *Echis*, *Macrovipera* and *Pseudocerastes*), each of which is represented by a single species, except the genus *Cerastes* which is represented by two subspecies. We also included distributional data for all species. Scale counts and body measurements are given for most species. Notes on biology and ecology as well as distribution maps and a complete listing for all previous and recent records are provided for each species. Zoogeographic analysis for the snake fauna of Jordan is also given, along with notes on species status and conservation.

> Key words

Snakes, Squamata, reptiles, Jordan, distribution, systematics, zoogeography, ecology, conservation.

Introduction

The diversity of reptiles in the Middle East was and still is of great interest for local and European herpetologists. Also, this area has received attention due to its geographic location that makes a land bridge between Europe, Africa and Asia.

Animal biodiversity in the Middle East is rather interesting due to its location, where three different faunal elements meet, namely: the Ethiopian, Oriental and Palearctic. The fauna is a combination of these elements in addition to the occurrence of endemic forms. Also, the entire area underwent many geological changes in the past that resulted in the formation of very different habitats and ecological regions.

Since the 1980's, the Middle East has witnessed growing interest in herpetology. The present knowledge of the snakes of Jordan is attributed to the continuous efforts of several local and foreign scientists (AMR, 2011). Since the mid 1970's the number of new records increased enormously, and our knowledge about the distribution, ecology and systematics of the snakes of Jordan has improved (DISI, 1983, 1985, 1987, 1990, 1993, 1996, 2002; DISI *et al.*, 1988, 1999, 2001, 2004; AL-ORAN, 2000; AL-ORAN & AMR, 1995; AL-ORAN *et al.*, 1997, 1998; AMR & DISI, 1998; AMR *et al.*, 1994, 1997a & b; ABU BAKER *et al.*, 2002, 2004; EL-ORAN, 1994; MODRY *et al.*, 2004; JOGER *et al.*, 2005; SHANAS *et al.*, 2006; VENCHI &

SINDACO, 2006; AMR, 2008; DAMHOUREYEH *et al.*, 2009). Two articles appeared with major taxonomic and ecological misinterpretations on the reptiles and snakes of Jordan (LAHONY *et al.*, 2002; AL-QURAN, 2009). The records of *Eryx jayakari* and *Echis pyramidium* by LAHONY *et al.* (2002) is erroneous, and the status of reptiles, especially snakes, indicated by AL-QURAN (2009) is entirely based on false assumptions, where they were divided into resident, breeding and migrant species.

Since 2000, snake taxonomy has been re-evaluated employing molecular techniques, and this has resulted in the reconsideration of several taxa (NAGY *et al.*, 2000, 2003, 2004; HELFENBERGER, 2001; LENK *et al.*, 2001; SCHÄTTI & UTIGER, 2001, GARRIGUES *et al.*, 2005). Thus, it is imperative now to revise the taxonomic status of snakes in Jordan to update these nomenclatural changes.

Interest in conservation and wildlife biology in Jordan increased enormously since the 1980's. At present, many local and governmental agencies are involved in field research in protected areas and nature reserves. This paper will be of great help to wildlife biologists to identify collected snakes, and help them to update their knowledge on the current distribution and taxonomic status of snakes in Jordan. The present work also documents all Jordanian specimens deposited in Jordanian and international museums.

Historical Background

Between 1863–1897, HENRY BAKER TRISTRAM, Canon of Durham, traveled in Lebanon, Syria, Palestine and Jordan as part of the “Palestine Exploration Fund” expedition. His book, “*Survey of Western Palestine: the Fauna and Flora of Palestine*” was considered for many years as the most comprehensive work in the area (TRISTRAM, 1884).

Under the auspices of the Palestine Exploration Fund, HENRY CHICHESTER HART joined Professor HULL in an expedition to Sinai and the Dead Sea area in 1883–1884. An account of this journey was published in 1891 (HART, 1891). He made a short account on the Fauna of Petra and Wādī ‘Araba and recorded *Platyceps elegantissimus* from ‘Aqaba.

MARIO GIACINTO PERACCA (1894), assistant in the Department of Zoology and Comparative Anatomy of Turin University, published the first contribution by an Italian expedition to the Middle East. He reported on the collections of ENRICO FESTA, made in 1893, during his survey in Palestine, Lebanon and adjacent regions (the localities fall in modern Lebanon, Jordan

and Palestine). He recorded *Dolichophis jugularis* from As Salt mountains.

JOHN C. PHILLIPS from the Museum of Comparative Zoology, Cambridge, Massachusetts (USA), and his assistant WILLIAM M. MANN, arrived to ‘Aqaba, Jordan, in April 1914. They traveled through Wādī ‘Araba, Petra, and southern Jordan. Their trip continued to include Jerusalem, Mount Hermon and Lebanon. The collection was deposited at the Museum of Comparative Zoology. THOMAS BARBOUR (1914) published the results of this expedition, where he listed 23 species of reptiles, including a new species, *Leptotyphlops phillipsi* (= *Leptotyphlops macrorhynchus*).

In 1927–1928 and later in 1934, HENRY FIELD headed the Marshall Field North Arabian Desert Expedition for archaeological and anthropological studies in the Near East. KARL P. SCHMIDT (1930, 1939) published the results of both expeditions along with other materials collected from Palestine, Trans-Jordan, Syria, Arabia and Iraq in 1930 and 1938. Also, a new subspecies, *Pseudocerastes persicus fieldi* (= *Pseudocerastes fieldi*), was described from the Bāyir area in the Eastern Desert.

GEORG HAAS, OTTO THEODORE and HEINRICH MENDELSSOHN traveled through Jordan during March and April 1936. They collected herpetological materials from ‘Ammān, Al Qaṭrānah, Ma‘ān, and between Petra and ‘Aqaba. HAAS (1943) published the results of this expedition. All this collection was deposited at the Hebrew University Museum. HAAS (1951) provided a summary of all records of reptiles between the Mediterranean Sea and the Syrian Desert including Jordan.

In 1963–1964, and later in 1966, two international expeditions were organized to explore the potential for the establishment of a Desert National Park and an International Biological Station in the Azraq area. The results of these expeditions were summarized by JOHN MORTON BOYD. During the first expedition in 1963, MOUNTFORT (1965) reported on a number of reptiles that he saw on his trips around the country. Reptiles collected by Mr. S. BISSERÔT and his colleagues were kept at the British Museum of Natural History and later examined by YEHUDAH WERNER. In his paper WERNER (1971) gave a list of snakes recorded from Jordan based on HAAS (1951).

Since 1983 Jordan has been extensively studied by the local herpetologists. These efforts have culminated in many publications covering various aspects including systematics, distribution, additional records, ecology and behaviour (see introduction for references).

In two separate expeditions, the Italians ROBERTO SINDACO and NICOLETTA FEDRIGHINI traveled into southern Jordan and the result of their collections was published in 1995 (SINDACO *et al.*, 1995).

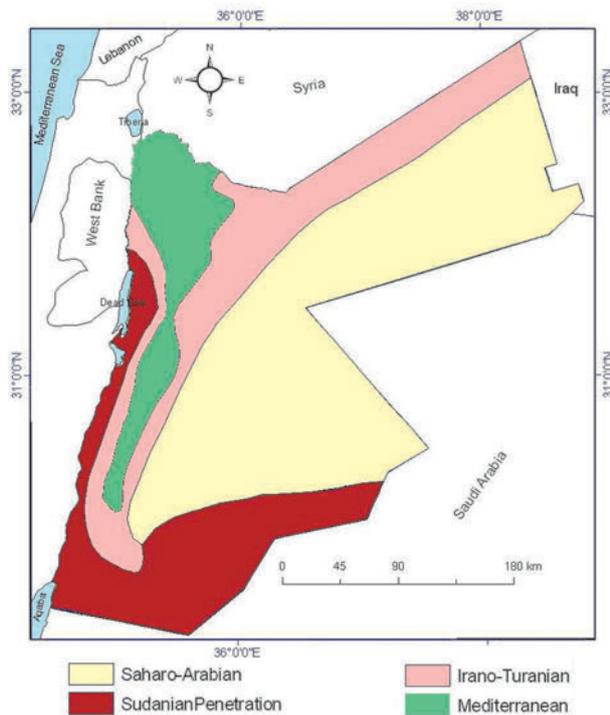


Fig. 1. Map of Jordan showing the biogeographical regions.

The efforts of DAVID MODRÝ, from the Czech Republic, have greatly enriched our understanding of various aspects of herpetology of Jordan. MODRÝ in collaboration with the authors attended many field studies covering the country. His dedication to the herpetological studies in Jordan is outstanding, and has resulted in the best published monograph on the “*Amphibians and Reptiles of the Hashemite Kingdom of Jordan*”, along with his co-authors (DISI *et al.*, 2001).

Biogeography of Jordan

Jordan is influenced by four major biogeographical regions (Fig. 1). Vegetation cover, soil texture, altitude and annual rain fall are among the major factors that shaped these biogeographical regions. AL-EISAWI (1985) and DISI & AMR (1998) agreed on the delineation of these four regions based on vegetation cover as well as animal distribution in Jordan.

1. The Mediterranean region: This region is represented by the mountain ranges extending from the north near Irbid, to Ra's an Naqb in the south. It consists of forested vegetation with an abundance of *Juniperus phoenicea*, *Retama raetam*, *Pistacia atlantica*, *Pinus halepensis*, *Quercus calliprinos*, *Quercus coccifera* and *Quercus ithaburensis* (Fig. 2, 3 and 4).

Open areas are characterized by high cover of the Thorny Burnet, *Sarcopoterium spinosum*. The altitude varies from 700 to 1500 m asl, with an average annual rain fall of 400–600 mm. The soil consists of several types, *terra rosa*, sandy and sandy-loamy due to erosion of the Nubian sandstone that dominates much of southern part of Jordan, (Fig. 5) and calcareous soil in the centre and north.

2. Irano-Turanian region: This region is represented by a narrow strip that surrounds the Mediterranean ecozone except in the far north. The Irano-Turanian region extends to the north-east, joining the Syrian Desert. The vegetation is dominated by *Anabasis articulata*, *Artemisia herba-alba*, *Astragalus spinosum*, *Retama raetam*, *Urginea maritima*, *Ziziphus lotus*, *Zygophyllum dumosum* and scattered *Juniperus phoenicea* and *Pistacia atlantica* trees (Fig. 6 and 7). The altitude ranges from 400 to 700 m asl, with average annual rainfall of 50–100 mm. The layer of surface soil is very thin or absent in some instances and surface rockiness is very high.

3. Sudanian Penetration region: This region extends from the south near 'Aqaba along Wādī 'Araba reaching as far north as Dayr 'Allā in the Jordan Valley, then extends to south eastern Jordan around Wādī Ramm, with sand stone mountains and granite mountains to the east. Acacia subtropical vegetation extends from 0 to 400 m asl, with annual precipitation of less than 50 mm. Trees of both *Acacia raddiana* and *Acacia tortilis* are common in varying densities (Fig. 8). Other trees such as *Tamarix* spp., *Ziziphus spina-christi*, *Zygophyllum dumosum*, are also common. Shrubs including *Anabasis articulata*, *Gymnocarpus decandrum*, *Haloxylon persicum*, and *Lycium* sp. are abundant. Soil is mostly sandy with rocky areas. Wadis are filled with alluvial materials washed from the calcareous sandstones (Fig. 9).

4. Saharo-Arabian region: This is the largest biogeographical region of Jordan and covers over 70% of the total area of the country. It is located to the east bordering the Irano-Turanian region from the west and the Sudanian Penetration region from the south-west. The sand dune desert vegetation is dominated by *Haloxylon persicum*, *Hammada scoparia* and *Ochradenus baccatus*. Open areas and wadi beds are characterized by *Achillea fragrantissima*, *Artemisia herba-alba* and *Astragalus* sp. (Fig. 10). Few scattered *Acacia tortilis* are also found. The soil mostly consists of gravel, sandy Hamada, saline and sandy soils. The altitude ranges from 100 m bsl to 800 m asl, with rainfall not exceeding 50 mm annually. Within this region, Azraq Oasis, stands as landmark in the middle of Jordan's eastern desert (Fig. 11).



Fig. 2. Mediterranean forests in Dibbin Nature Reserve, near Jarash.



Fig. 3. Dense oak forests of *Quercus calliprinos* in the Ajlune area, northern Jordan.



Fig. 4. Deciduous oak forests, *Quercus ithaburensis*, mixed with the Kharoub, *Ceratonia siliqua*, in Melka area.



Fig. 5. Mountains of Petra dominated by sand-stone formation.



Fig. 6. Typical Hamada habitat of the Irano-Turanian region in eastern Jordan.



Fig. 7. The black lava desert of north-eastern Jordan.

Materials and methods

The present study includes museum collections from the Jordan University Museum (JUMR), Mu'tah University Museum (MUM), Jordan University of Science & Technology Museum (JUSTM), the Jordan Natural History Museum at Yarmouk University (JNHM), recent collections made by the authors and

new localities provided by the Royal Society for Conservation of Nature staff. Previous records indicated in the literature were also extracted and included in the distribution maps.

Materials presented in this work were either collected or observed from about 230 localities in Jordan (Annex 1, Fig. 12).

Data on specimens deposited in other museums were retrieved from on-line collection catalogues or



Fig. 8. Acacia-dominated region in Wādī 'Araba.



Fig. 9. The sand stone desert of Wādī Ramm, southern Jordan.



Fig. 10. Typical Saharo-Arabian habitat near Bāyir area.



Fig. 11. Marshes of Azraq in the middle of the eastern desert.

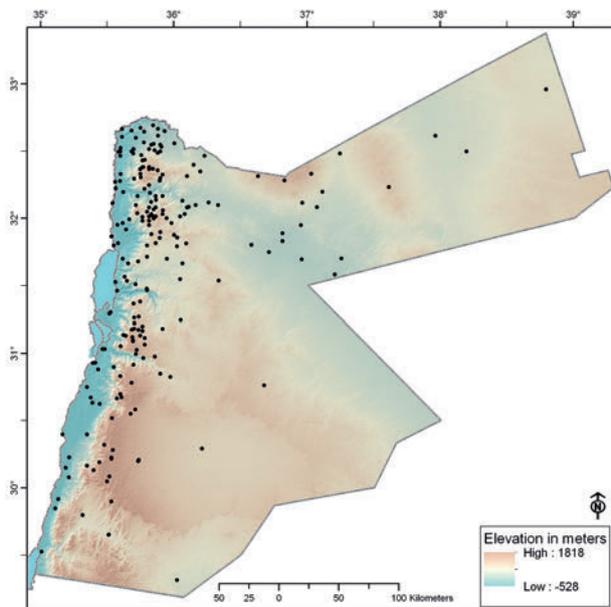


Fig.12. Map of Jordan showing localities from which materials were collected or observed.

Abbreviations

BMNH or BM	British Museum of Natural History
CAS	California Academy of Sciences Museum
MZUT	Collezione del Dipartimento di Biologia Animale dell'Università di Torino
FMNH	Field Museum of Natural History
HUJ-R	Hebrew University Museum, Reptile Collection
HLMD	Hessisches Landesmuseum Darmstadt
MCC	Museo Civico di Storia Naturale di Carmagnola
MZUR	Museo di Zoologia dell'Università "La Sapienza" di Roma
MCZ	Museum of Comparative Zoology Harvard
NHMW	Museum of Natural History Vienna
SMF	Senckenberg Museum Frankfurt/M.
ZFMK	Zoologisches Forschungsmuseum Alexander Koenig, Bonn

through communications with curators. Following are museums from which specimens from Jordan are reported:

For comparative studies, *Macrovipera lebetina* and *Pseudocerastes fieldi* specimens were examined in the following museums:

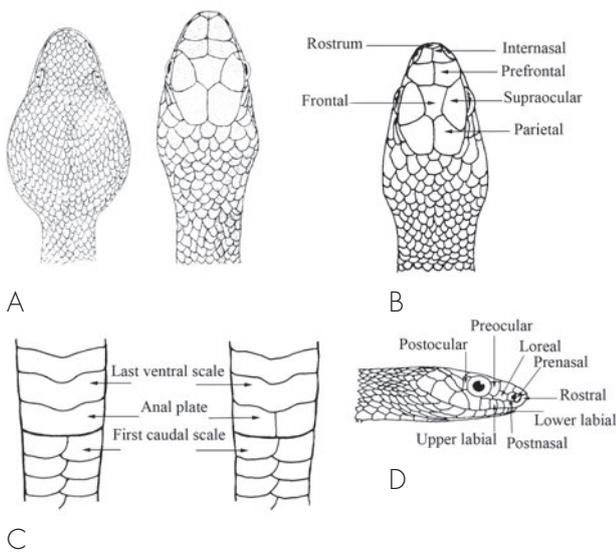


Fig. 13. Scale arrangements and types used in snake classification. **A.** Type of head scale (with asymmetrical and symmetrical head scales). **B.** Dorsal view of the head showing names of head scales. **C.** Types of caudal scales. **D.** Lateral view of the head naming major scales.

- GM Natural History Muséum Geneva
- ZMB Museum für Naturkunde Berlin
- NHMW Museum of Natural History Vienna
- SMF Senckenberg Museum Frankfurt/M.
- ZFMK Zoologisches Forschungsmuseum Alexander Koenig, Bonn
- ZSM Zoologische Staatssammlung München

Locality name spelling and coordinates were based on the Jordan Gazetteer (Anon, 1990). Maps were prepared using GIS Info software.

- CS caudal scales (= subcaudals)
- MBS midbody scales (= scale rows at mid-body)
- LL lower labials
- PO preoculars
- PtO postoculars
- SV snout-vent length (in mm)
- T tail length (in mm)
- UL upper labials
- VS ventral scales

Results

The snake fauna of Jordan consists of 37 species and subspecies belonging to seven families (Typhlopidae, Leptotyphlopidae, Boidae, Colubridae, Atractaspididae, Elapidae and Viperidae). Families Lepto-

typhlopidae, Boidae and Elapidae are represented by a single species each, *Leptotyphlops macrorhynchus*, *Eryx jaculus* and *Walterinnesia aegyptia* respectively. Family Typhlopidae is represented by two species, while family Atractaspididae is represented by three species in two genera. Species of the former genus *Coluber* were updated and the newly adopted names are included. Family Colubridae is now represented by twelve genera (*Dolichophis*, *Eirenis*, *Hemorrhoids*, *Lytorhynchus*, *Malpolon*, *Natrix*, *Platyceps*, *Psammophis*, *Rhagerhis*, *Rhynchocalamus*, *Spalerosophis* and *Telescopus*) including 24 species. Family Viperidae includes five genera (*Cerastes*, *Daboia*, *Echis*, *Macrovipera* and *Pseudocerastes*) with a total of six species and subspecies.

Key to families of snakes in Jordan

- 1 Ventral scales are not enlarged, eyes covered by scales (Fig. 14A), worm-like in appearance 2
- 2 Ventral scales enlarged, eyes not covered by scales (Fig. 14B), not worm-like in appearance 3

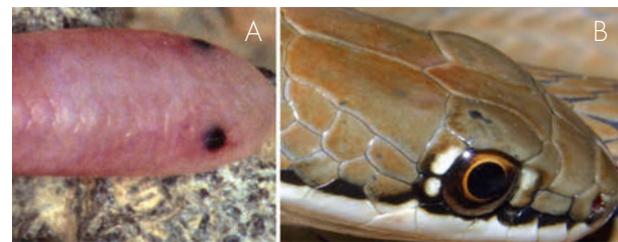


Fig. 14. **A.** Eyes covered by scales. **B.** Eyes not covered by scales.

- 2 Midbody scales consist of 20–24 scales, tail length not exceeding its width **Typhlopidae**
- Midbody scales consist of 14–16, tail length longer than its width **Leptotyphlopidae**
- 3 Head covered by small asymmetrical scales (Fig. 13A & 15B) 4
- Head covered by symmetrical head shields (Fig. 13A & 15A) 5



Fig. 15. **A.** Head covered by symmetrical shields. **B.** Head covered by small scales.

- 4 Head not distinct from neck and ventral scales are narrow **Boidae**

- Head distinct from neck and ventral scales are not narrow **Viperidae**
- 5** First 2–9 caudal scales are entire, and the others are in pairs (Fig. 13C) **Elapidae**
- Caudal scales are single **6**
- 6** Loreal scale present (Fig. 16A) **Colubridae**
- Loreal scale absent (Fig. 16B) ... **Atractaspididae**

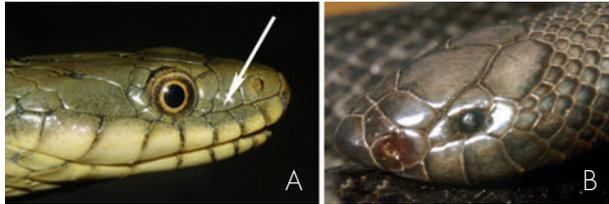


Fig. 16. A. Loreal present in species of family Colubridae. B. Loreal absent in species of family Atractaspididae.

Family Typhlopidae MERREM, 1820

The blind snakes are small with a small head and a short, blunt tail. Ventral scales are not enlarged as in most snakes. Their rudimentary eyes and rather rigid, cylindrical bodies distinguish the blind snakes from other snakes. Typhlopids have toothed, movable maxilla, while the premaxilla is toothless and firmly articulated with the snout. The maxillae possess several teeth and are attached to the skull via mobile articulations. They differ from the thread snakes (Family Leptotyphlopidae) by having 20 or more mid-body scales. They are fossorial and feed on immature insects and other arthropods.

Typhlopids are reported from all continents. This family is represented by six genera (*Acutotyphlops*, *Cyclotyphlops*, *Xenotyphlops*, *Ramphotyphlops*, *Rhinotyphlops* and *Typhlops*) with a worldwide distribution. In Jordan, this family is represented by two species (*Typhlops vermicularis* and *Rhinotyphlops simoni*).

Key to Snakes of Family Typhlopidae

- 1** Snout normal, without cornified scales, tail terminates with a spine *Typhlops vermicularis*
- Snout projected anteriorly, with cornified scales, tail without a spine *Rhinotyphlops simoni*

Genus *Rhinotyphlops* FITZINGER, 1843

ROUX-ESTAEVE (1974) removed this species from the genus *Typhlops* based on cranial pholidosis and snout morphology. *Rhinotyphlops* includes a large number of blind snakes, typically, members of this genus have a horny thickening at the rostral at the end of the snout. This feature is more prominent among adults than young specimens. The rostral is more developed than in *Typhlops*, and it occupies a larger portion of the lower region of the head, where the ratio of the head width to the rostral width is always less than two (ROUX-ESTAEVE, 1974).

Rhinotyphlops simoni (BOETTGER, 1879)

Onychocephalus simoni BOETTGER, 1879. – Ber. Senck. Ges. **1878–79**, p. 58, and **1880–81**, p. 135. pl. iii, fig. 1.

Typhlops simoni BOULENGER, 1893. – Catalogue of the Snakes in the British Museum (Natural History), **1**: p. 51. – HAAS, 1951, Bulletin of the Research Council of Israel, **1**: p. 82. – DISI, 1985, The Snake, **17**: p. 33. – DISI *et al.*, 1988, The Snake, **20**: p. 43.

Rhinotyphlops simoni WALLACH, 1994. – Bull. Inst. Roy. Sci. Nat. Belgique Biol., Bruxelles, **64**: 217–219. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 241.



Fig. 17. Simon's Blind Snake, *Rhinotyphlops simoni*, from Mu'tah (D. MODRÝ).

Common name. Simon's Blind Snake.

Range. Jordan, Palestine and Syria.

Distribution in Jordan. Fig. 18.

Material Examined (N=6). JUMR 430, 1979, Ghawr al Hadīthah. JUMR 458, 1979, El Hamma. JUMR 1064, 5 September 1982, 'Al'āl. JUMR 1177, 1982, Dayr Abū Sa'īd. JUMR 1282, 1982, Dayr Abū Sa'īd. JNHM 496, 6 April 1982, Dayr 'Allā.

Materials recorded in other museums. MZUT-R1750, Mādabā. ZFMK 29242, rocky valley on the NE shore of the Dead Sea.

New localities. Ar Ramthā and Jarash.

Published records. 'Al'āl, Dayr Abū Sa'īd, Dayr 'Allā, Ghawr al Hadīthah, Irbid (DISI, 1985), Mādabā (SINDACO *et al.*, 1995), Mu'tah (DISI *et al.*, 2001).

Systematics. Although *R. simoni* has 20–22 mid-body scales, as do other members of family Typhlopidae,

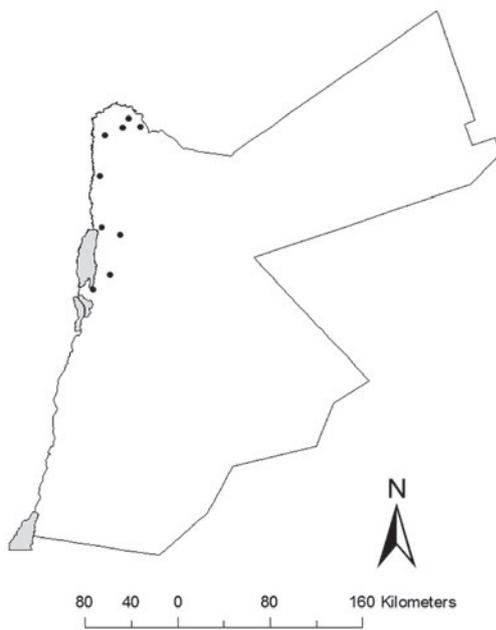


Fig. 18. Distribution of *Rhinotyphlops simoni* in Jordan.

ROUX-ESTAEVE (1974) removed this species from the genus *Typhlops* based on cranial pholidosis and snout morphology.

Diagnosis. This is a small worm snake, with a maximum length of 23 cm. Head is not distinct from the rest of the body. Eyes are rudimentary and covered by a scale (Fig. 17). Snout prominent and projects forward, possessing a sharp cornified cutting edge. Head shields are covered with cornified structures. Terminal spine in the tail is absent. Rostral very large, both upper and lower parts longer than broad; nasal cleft extending from the first labial to the nostril, which is close to the rostral; preocular present, as large as the ocular, but much smaller than the nasal, in contact with the second and third; prefrontal and supraoculars larger than the scales on the body; four UL. MBS 20–22. SV 182–219.

Colouration. Uniform light pink to light rosy colour dorsally and ventrally. Young individuals have a translucent glossy light pink colour (Fig. 17).

Habitats and ecology. Two specimens were collected from under rocks, within area of abundant shrubs and annual plants near Ar Ramthā. This snake prefers humid regions. The distribution pattern as indicated by locality records, suggests that *R. simoni* occurs in both the Mediterranean and Irano-Turanian biotopes, where humidity prevails. Both species of blind snakes (*T. vermicularis* and *R. simoni*) were found sympatrically in Dayr Abū Sa'īd within the Mediterranean ecozone. Similarly in Palestine, HAAS (1951)

stated that it was found in coastal areas, around Lake Tiberias as well as Jericho in the Jordan Valley. DISI (1985, 1987) stated that *R. simoni* inhabits the warm regions of Jordan that are characterized by loose damp soil.

Biology. Very little is known about the biology of this snake. It probably feeds on ants and immature insects.

Remarks. Simon's Blind Snake is an endemic species of the Eastern Mediterranean. The southern end of the Dead Sea (Ghawr al Hadithah) may represent its most southern distribution range. *Rhinotyphlops episcopus* was described from Turkey and is considered as a sister taxon for *R. simoni* (FRANZEN & WALLACH, 2002).

Genus *Typhlops* SCHNEIDER, 1811

Members of this genus are characterized by their worm-like body. Head not distinct from neck. The rostral, nasal, ocular and preocular shields are large. The nasal shield is divided. Eyes are vestigial and appear as small black spots beneath the ocular scale. Tail very short.

In southwest Asia, this genus is represented by two species; *Typhlops vermicularis* in most of the Middle East and *Typhlops wilsoni* in Iran.

Typhlops vermicularis MERREM, 1820

Typhlops vermicularis MERREM, 1820. – Tent. Syst. Amphib., p. 158. – DUMÉRIEL & BIBRON, 1844, Schleg. Abbild., p. 37. – BOULENGER, 1893, Catalogue of the Snakes in the British Museum (Natural History), 1: p. 21. – FLOWER, 1933, Proceedings of the Zoological Society of London, 1933: p. 802. – HAAS, 1951, Bulletin of the Research Council of Israel, 1: p. 82. – DISI, 1985, The Snake, 17: p. 43. – DISI, AMR & DEFOSSE, 1988, The Snake, 20: p. 43. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 243.

Typhlops flavescens BIBRON & BORY in BORY. – 1833, Expéd. Sci. Morée Zool. (1833): p. 72, pl. xiii, fig. 3.

Argyrophis vermicularis GRAY, 1845. – Catalogue of the Specimens of Lizards in the Collection of the British Museum, p. 137.

Typhlops syriacus JAN, in JAN & SORDELLI, 1864. – JAN, op. cit.: p. 15, pls. iv & v., fig. 5.

Common name. The Worm Snake.

Range. Southeastern Europe, across Turkey into Syria and Jordan, and extends eastwards to Iran.

Distribution in Jordan. Fig. 20.



Fig. 19. The Worm Snake, *Typhlops vermicularis*, from Irbid.

Materials examined (N=25). JUMR 103, 4 April 1978, Şakhrāh. JUMR 173, 6 May 1976, Māhiş. JUMR 448, 1978, Dayr Abū Sa'īd. JUMR 870-871, 7 May 1982, Wādī as Sīr. JUMR 918, 16 May 1982, Irbid. JUMR 1392, June 1983, Irbid. JNHM 93, April 1982, Irbid. JNHM 96, 17 November 1982, Irbid. JNHM 208, 19 April 1982, Irbid. JNHM 215, 27 April 1982, Irbid. JNHM 237, May 1982, Irbid. JNHM 516, April 1983, Irbid. JNHM 517, 16 April 1983, Irbid. JNHM 567, 24 April 1983, Irbid. JNHM 603, 31 May 1983, Afnā. JNHM 604, 1 June 1982, Irbid. JNHM 722, 10 April 1984, Irbid. JNHM 723, 14 April 1983, Irbid. JNHM 915, April 1982, Aidūn. JUSTM 221, 23 May 1993, Irbid. JUSTM 222, 7 April 1997, Zūbiyā. JUSTM 407, 2001, Rihābā. JUSTM 414, 27 August 2001, Ajlūn. MUM 0342, 16 April 1993, Aṭ Taflā.

New localities. Ajlūn Nature Reserve, Al Kamāliyah, 'Am-mān, Aqrabā, Ar Ramthā Marw and Şāfūt.

Published records. Dayr Abū Sa'īd, Irbid, Māhiş, Şakhrāh, Wādī as Sīr (DISI, 1985; DISI *et al.*, 1988), Aṭ Taflā (EL-ORAN *et al.*, 1994), Irbid (AMR *et al.*, 1997a), Petra (DISI & HATOUGH-BOURAN, 1999), Ajlūn, As Salt, Ḍānā, Ibbīn, Jarash, Zūbiyā (DISI *et al.*, 2001).

Systematics. The genus *Typhlops* includes some 133 species and is represented by *Typhlops vermicularis* in the Middle East. GRILLITSCH & GRILLITSCH (1993) gave a comprehensive account on its systematics and other details on its biology and ecology.

Diagnosis. Snout depressed, rounded and strongly projecting. Nostrils are laterally located. Rostral is about 1/3 the head width. Nasals are incompletely divided, the cleft proceeding from the second labial. Preocular is present, about as broad as the ocular and in contact with the second and third labials. Eyes are indistinguished (Fig. 19). Upper head scales moderately enlarged. Four UL. Tail as broad as long, terminates with a dark spine. MBS 22–24. SV 167–268, T 4–5 mm. Maximum length 35 cm.

Colouration. Body colouration is usually uniform. Dark-brown dorsally, yellowish ventrally. Young specimens may have pinkish or glossy red colouration.

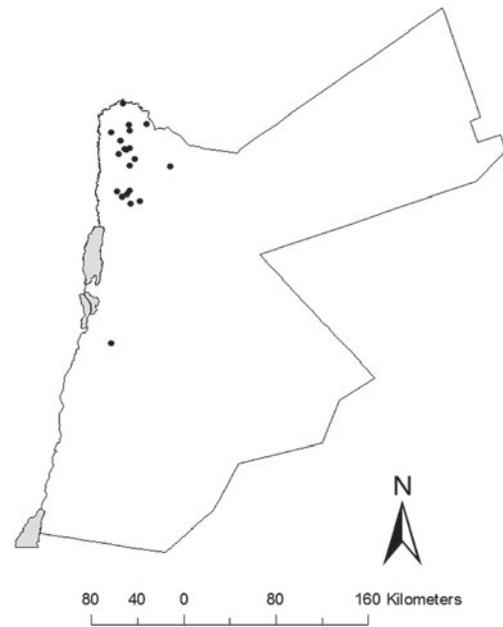


Fig. 20. Distribution of *Typhlops vermicularis* in Jordan.

Habitats and ecology. This species inhabits the Mediterranean biotope in Jordan as suggested from the collection sites. They are found either under stones or in burrows in red soil (*terra rosa*), where they seek refuge in the cracked soil. This snake is fossorial and appears above ground during April and May, when soil is still moist and humid. One specimen was found in a burrow 50 cm below ground level (DISI, 1985). HAAS (1951) indicated that the worm snake is abundant in marshy areas, and high rainfall in hilly areas is essential requirement for its distribution. CLARK & CLARK (1973) found this species in association with ant colonies, which perhaps is their main food source. In Egypt, it was collected from vegetated sandy areas with scattered stones (BAHA EL DIN, 2006). It was found in mounds of the Mole Rat, *Spalax ehrenbergi* (PAVLICEK *et al.*, 2005).

Biology. PERRY (1985) reported that 1–3 eggs are laid between June and July, and they hatch later in autumn. MIENIS (1982) reported on the predation of this snake by the blackbird (*Turdus merula*). AMR *et al.* (1997a) reported on the aggregation behavior of the worm snake, where 23 individuals were found under a stone in a garden of a house in Irbid. They attributed this aggregation to either mating or moisture conservation behavior.

Remarks. Southern Jordan represents the most southern distribution range of this species. Several authors stated that sexual dimorphism is absent in the worm snake. PERRY (1985) indicated that subcaudal scale counts are higher in males (10 scales) than females

(7–8 scales). He suggested that subcaudal scale count is a reliable method for sexing *T. vermicularis*.

Family Leptotyphlopidae STEJNEGER, 1891

The thread or slender blind snakes are fossorial in nature. They are characterized by their slender elongated body, and the eyes are rudimentary and covered by scales. 14–16 mid-body scales separate this family from the blind snakes (Family Typhlopidae). The upper jaws of leptotyphlopids are immovable, and only the dentary possesses teeth.

Species of this family occur in tropical America, southwest North America, the Caribbean, and Africa with two species reaching east to Pakistan and India (HAHN, 1979). This family includes two genera: *Leptotyphlops* and *Rhinoleptus* (GASPERETTI, 1988). In Jordan, this family is represented by a single species (*Leptotyphlops macrorhynchus*).

Genus *Leptotyphlops* FITZINGER, 1843

The body is worm-like, thin and elongated. The rostral, nasal, and ocular shields are large. Nasal shields are divided or semi-divided, extending to the head upper surface. Five species and subspecies are known to occur in southwest Asia (WELCH, 1983).

Leptotyphlops macrorhynchus (JAN, 1861)

Stenosoma (*Ramphostoma*) *macrorhynchum* JAN, 1861. – Arch. Zool. Anat. Phys., **1**: p. 190.

Glauconia macrorhynchus BOULENGER, 1893. – Catalogue of the Snakes in the British Museum (Natural History), **1**: p. 61.

Leptotyphlops phillipsi BARBOUR, 1914. – Proceedings of New England Zoology Club, **5**: p. 87.

Leptotyphlops macrorhynchus – HAAS, 1951, Bulletin of the Research Council of Israel, **1**: p. 82. – KHALAF, 1959, Reptiles of Iraq with Notes on the Amphibians, p. 63. – DISI, AMR & DEFOSSE, 1988, The Snake, **20**: p. 43. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 57. – LEVITON, ANDERSON, ADLER & MINTON, 1992, Handbook to the Middle East Amphibians and Reptiles, p. 82. – SCHLEICH, KÄSTLE & KABISCH, 1996, Amphibians and Reptiles of North Africa, p. 475. – DISI,



Fig. 21. The Hook-billed Blind Snake, *Leptotyphlops macrorhynchus*, from Wādī Ramm (D. MODRÝ).

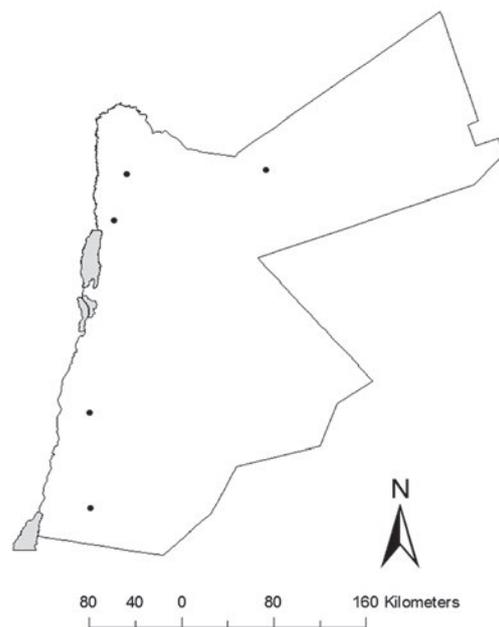


Fig. 22. Distribution of *Leptotyphlops macrorhynchus* in Jordan.

MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 247. – GÖÇMEN, FRANZEN, YILDIZ, AKMAN & YALÇINKAYA, 2009, Salamandra, **45**: p. 111.

Leptotyphlops macrorhynchus macrorhynchus GASPERETTI, 1988. – Fauna of Saudi Arabia, **9**: p. 200. – EGAN, 2007, Snakes of Arabia: A Field Guide to the Snakes of the Arabian Peninsula and its Shores, p. 53.

Common name. Hook-billed Blind Snake, Beaked Thread Snake.

Range. Western Africa to Turkey and to the northwestern Indian eastwards (LEVITON *et al.*, 1992).

Distribution in Jordan. Fig. 22.

Material examined (N=1). JUMR 2184, April 1995, Petra.

New localities. Mādabā.

Published records. Petra (BARBOUR, 1914), Safawi (DISI *et al.*, 1999), Petra (DISI & HATOUGH-BOURAN, 1999), Wādī

Ramm (ABU BAKER *et al.*, 2004), King Talal Dam (DISI *et al.*, 2001).

Material recorded in other museums. FMNH 73385, (paratype), April 1914, Arabia, *leg.* PHILLIPS & MANN (listed as *Leptotyphlops phillipsi*). MCZ R-9638, 9640–9641, 9644–9645, 9647, 9649–9650, January 1914–31 December 1914, Petra, *leg.* PHILLIPS & MANN.

Systematics. BARBOUR (1914) described *Leptotyphlops phillipsi* from Petra based on colour differences from *L. macrorhynchus*. Later, HAHN (1978) listed *L. phillipsi* as a synonym of *L. macrorhynchus*. This view is shared by LEVITON *et al.* (1992).

Diagnosis. Earthworm-like snake. Head small and not distinct from neck. Snout with hooked end (Fig. 21). Eyes under one large scale. Rostral shield is enlarged and rounded. Dorsal scales smooth, with 14 mid-body scales. Anal shield is entire. Maximum total length 28 cm.

Colouration. Body is uniformly light pink to reddish. Ventral side is more translucent.

Habitats and ecology. This snake was collected from a dry region (Safawi) with low annual rainfall, although, it was taken from under a rock with damp soil. Another specimen was collected from the sand-stone desert in Wādī Ramm. In Iraq, CORKILL (1932) reported that the Hook-billed Blind Snake is a nocturnal species. Habitats include river banks, coastal plain sands, and houses (WEBER, 1960; SCHLEICH *et al.*, 1996). In Tukey, this species was collected during daytime from under stones on dry stony slopes, whose cover included both heavily degraded vegetation and dense stands of grasses and herbs (GÖÇMEN *et al.*, 2009).

Biology. Several authors reported on the insectivorous diet for this species (CORKILL, 1932; SCHLEICH *et al.*, 1996). *Coluber rhodorachis* was found to feed on this blind snake (MULDER, 2002).

Remarks. Testis of this snake consists of 4–15 distinct ellipsoid-like units. The shape of the testis resembles that of *Typhlops vermicularis* and *T. simoni* may suggest that it evolved independently in the two families (WERNER & DROOK, 1967).

Family Boidae GRAY, 1825

This family includes the boas and pythons. Boids feature thick bodies that help them in suffocating their

prey. Head is covered by small scales and the ventrals are narrow. The dorsal scales are small and smooth. Eyes are very small with elliptical pupils. In the Middle East, it is represented by a single genus *Eryx*.

Genus *Eryx* DAUDIN, 1803

The body is cylindrical terminating in a short conical tail. Head is not distinct from neck, and is covered by small scales. Eyes are very small with vertical pupils. Ventrals are narrow and all subcaudal scales are single. Twelve species and subspecies are known so far in southwest Asia (WELCH, 1983).

Eryx jaculus (LINNAEUS, 1758)

Anguis jaculus LINNAEUS, 1758. – Syst. Nat., ed. 10, 1: p. 228.

Eryx jaculus BOULENGER, 1893. – Catalogue of the Snakes in the British Museum (Natural History), 1: p. 125. – HAAS, 1951, Bulletin of the Research Council of Israel, 1: p. 81. – KHALAF, 1959, Reptiles of Iraq with Notes on the Amphibians, p. 64. – DISI, AMR & DEFOSSE, 1988, The Snake, 20: p. 43. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 61. – SCHLEICH, KÄSTLE & KABISCH, 1996, Amphibians and Reptiles of North Africa, p. 473. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 249.

Eryx jaculus jaculus DISI, 1985. – The Snake, 17: p. 34. – GASPERETTI, 1988, Fauna of Saudi Arabia, 9: p. 206.

Eryx (Eryx) jaculus jaculus LEVITON, ANDERSON, ADLER & MINTON, 1992. – Handbook to the Middle East Amphibians and Reptiles, p. 84.

Common name. Western Sand Boa, Javelin Sandboa.

Range. Southern Europe and extending through Turkey, Syria, Jordan and the neighboring countries, North Africa through the Arabian Peninsula to Iran.

Distribution in Jordan. Fig. 24.

Material examined (N=22). JUMR 371, 2 September 1979, Jada'a. JUMR 565, 1978, Dayr Abū Sa'id. JUMR 578, 2 May 1979, Basta. JUMR 588, May 1979, 'Ammān. JUMR 681, 12 May 1981, Ayl. JUMR 839, 6 June 1983, Jāwā. JUMR 935, May 1982, Shafa Badran. JUMR 956, August 1982, Dayr 'Allā. JUMR 1163, 1982, Dayr Abū Sa'id. JUMR 1326, May 1983, Ar Ramthā. JUMR 1477, 2 August 1983, Marw. JUMR 1483, 11 August 1983, Al Fujayj. JUMR 2020, June 1991, Kuraymah. JUMR 2525, June 1998, Salihī. JNHM 263, 23 May 1982, Zabdah. JNHM 267, 2 June 1982, 2 km E Irbid. JUSTM 311, August 1994, Ajlūn. JUSTM 400, 15 July 1998. MUM 0068 & 0076, April, 1991, Al Mazār. MUM 0079, 10 July 1991, Abū al Lasan. MUM 0318, 5 June 1992, Nakhil.



Fig. 23. The Javelin Sand-boa, *Eryx jaculus*, collected from Irbid.

New localities. Birqish, Dānā Nature Reserve, Dibbīn Nature Reserve, Samā Al Rousan, Umm al Qiṭṭayn.

Published records. ‘Ammān area, Dayr ‘Allā, Dayr Abū Sa‘īd, Al Fujayj- Ash Shawbak, Jada‘a, Jāwā, Marw, Shafa Badran, along the high way to Petra, 2 km E Irbid (DISI, 1985), ‘Ammān, Jāwā, Safawi, between Azraq and Safawi (DISI *et al.*, 1988), Abū al Lasan, Al Mazār, Nakhl (Al Karak) (EL ORAN *et al.*, 1994), Al Karak, Petra (AMR *et al.*, 1994), between Safawi and Dayr al Kahf (DISI *et al.*, 1999).

Systematics. Three subspecies are recognized: *E. j. turcicus* occurring in the Balkan to western Anatolia, *E. j. familiaris* distributed from eastern Turkey to northwestern Iran, and *E. j. jaculus* in Syria, Jordan and Palestine (TOKAR, 1991; TOKAR & OBST, 1993).

Diagnosis. Head not distinct from neck. Rostral large and broad, with angular horizontal edge; one or two pairs of small shields: behind the rostral, five to nine scales from eye to eye across the forehead; seven to fourteen scales round the eye, which is separated from the labials by one or two rows of scales; ten to fourteen UL (Fig. 23). A mental groove is present. Eyes are small with vertical pupils. Scales smooth, feebly keeled on the posterior part of the body and on the tail, in 40 to 50 rows. Ventrals narrow, 165–200; anal scale small; CS 15–36 (25–36 in males and 19–27 in females). Tail short and obtusely conical. Maximum total length 60 cm.

Colouration. Yellow-clay, yellow-brown to red. Dark strips from the eye up to the end of the mouth. The dorsum with dark spots and crossbars (Fig. 23), which may connect to form a “network”. On the sides, dark irregular spots are present. The ventral side is lighter, often with dark speckled spots.

Habitats and ecology. The Western Sand Boa occurs in both the Mediterranean and the Irano-Turanian biotopes. It was found under rocks in both red soil typical for the Mediterranean biotope, and in loose soil in the eastern desert. However, humidity is essential for

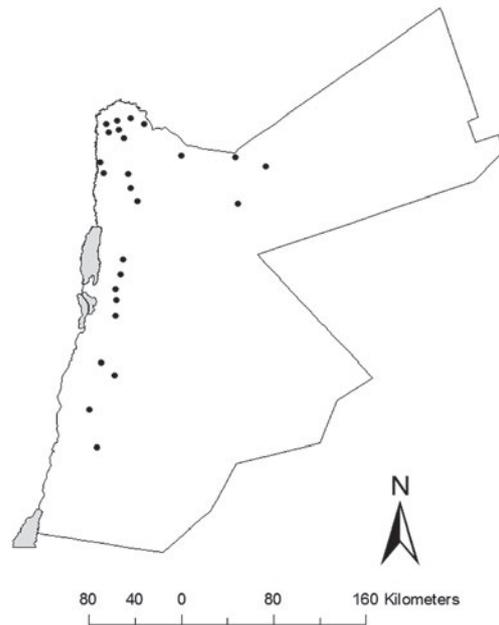


Fig. 24. Distribution of *Eryx jaculus* in Jordan.

its presence. This boa was never collected from “true sand” areas in Jordan.

Biology. This is an ovoviviparous snake with a litter size of 6–20 (DISI *et al.*, 2001). It was found to feed on lizards and rodents, occasionally birds and insects (TOKAR & OBST, 1993; SCHLEICH *et al.*, 1996). In captivity SCHLEICH *et al.* (1996) reported that the Javelin Sand-boa accepted mice, birds (*Passer domesticus*) and lizards including the Ocellated Skink and the Caucasian Agama as well as snake eggs. When alarmed, it points its head into the soil vertically and starts burying itself. YOM-TOV & WOOL (1997) recovered remains of this snake from pellets of the Barn Owl.

Remarks. This species has a wide range of distribution extending from North Africa to Iran. Variations among the forms in Jordan, desert and Mediterranean regions, requires further investigations.

Family Colubridae OPPEL, 1811

Family Colubridae comprises more than half the snake species worldwide. The majority of colubrids are terrestrial, with some aquatic, arboreal and fossorial forms. Some colubrids are aglyphous (fangs are not grooved and the venom gland is absent), opistho-

glyphous (some maxillary teeth are grooved and usually located under the eye level, and connected to a venom gland). Morphologically, this family exhibits a wide range in type and shape of dorsal and subcaudal scales, as well as in other external features.

Twenty-four species belonging to 12 genera occur in Jordan (*Dolichophis*, *Eirenis*, *Hemorrhais*, *Lytorhynchus*, *Malpolon*, *Natrix*, *Platyceps*, *Psammophis*, *Rhagerhis Rhynchocalamus*, *Spalerosophis* and *Teloscopus*).

Recent studies of the genus *Coluber* based on mitochondrial and nuclear genes (NAGY *et al.*, 2004), restrict the genus *Coluber* to the American species, and assign the species occurring in Europe, Africa and Asia to other genera.

Assigning species of the genus *Coluber* under the genus *Platyceps* was established a long time ago. WILSON (1967) suggested reallocation of *Coluber fasciolatus* to the genus *Platyceps*. As mentioned above, recently, species previously included in this genus have undergone several taxonomic treatments based on phylogenetic studies on mitochondrial and nuclear genes. Based on these studies NAGY *et al.* (2004) proposed replacing the use of *Coluber* for the European forms replacing the *Hierophis*, and moving the *Coluber jugularis* complex to the genus *Dolichophis*. These changes have caused problems for local zoologists. SCHÄTTI & UTIGER (2001) and SCHÄTTI *et al.* (2001) recognize the genera *Hemorrhais*, *Hierophis* and *Platyceps* for some species previously assigned to the genus *Coluber*. The present classification follows these new proposals.

Key to the Jordanian species of Family Colubridae

- 1 Upper labials not entering the eyes (Fig. 25A) *Spalerosophis diadema cliffordi*
- At least one upper labial entering the eyes (Fig. 25B) 2

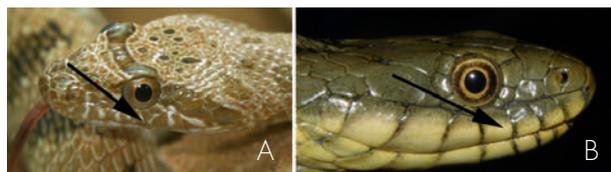


Fig. 25. A. Upper labials not entering the eye. B. At least one upper labial entering the eyes.

- 2 Dorsal scales strongly keeled (Fig. 26A) *Natrix tessellata*
- Dorsal scales are not strongly keeled (Fig. 26B) 3



Fig. 26. A. Dorsal scales strongly keeled. B. Dorsal scales are not strongly keeled.

- 3 Vertical or elliptical pupil in daylight (Fig. 27A) .. *Telescopus* 5
- Rounded pupil in daylight (Fig. 27B) 4

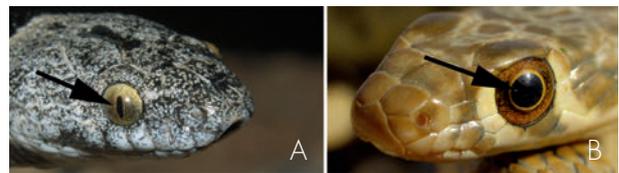


Fig. 27. A. Vertical or elliptical pupil. B. Rounded pupil.

- 4 Rostral projecting outwards, wedge-shaped (Fig. 28) *Lytorhynchus diadema*
- Rostral not projecting outwards, not wedge-shaped 7

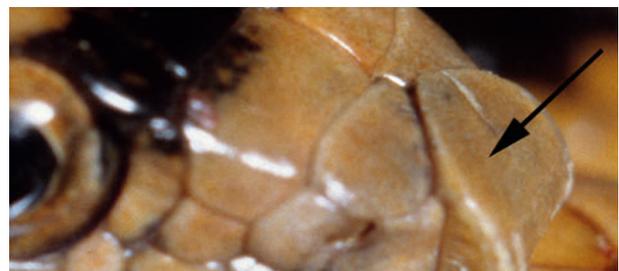


Fig. 28. Rostral projecting outwards and wedge-shaped.

- 5 Loreal in contact with the eye (Fig. 29A) 6
- Loreal in contact with a preocular (Fig. 29B) *T. dhara*

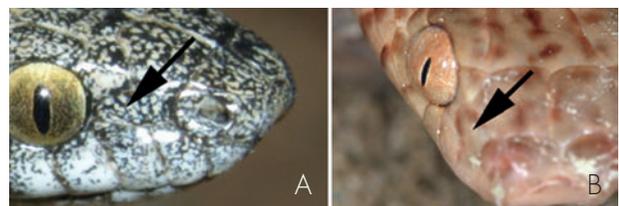


Fig. 29. A. Loreal in contacts with the eye. B. Loreal is separated from the eye by a preocular.

- 6 Belly black; head black to dark grey with black and light grey mottles; 172–196 ventrals; 39–58 subcaudals; 15–29 crossbars *T. nigriceps*
- Belly grey, with densely spread fine black spots, either vanishing or forming transverse bars; 206–214 ventrals; 49–64 subcaudals; 28–47 crossbars *T. hoogstraali*

- 7 Head with a convex profile 8
- Head without a convex profile 9



Fig. 30. A. Two loreals are present. B. One loreal is present.

- 8 2 loreals, frontal narrower than the supraoculars; 17–19 scale rows at midbody (Fig. 30A) *Malpolon insignitus*
- 1 loreal, frontal as wide as the supraoculars; 17 scale rows at midbody (Fig. 30B) *Rhagerhis moilensis*
- 9 15–17 rows of scales counting across mid body 10
- More than 17 rows of scales across mid body 16
- 10 Number of subcaudal scales over 90 *Psammophis schokari*
- Number of subcaudal scales fewer than 90 11
- 11 Rostral large and extends to the upper surface of the snout and partially separates internasals (Fig. 31) *Rhynchocalamus melanocephalus*
- Rostral not large and does not extend to the upper surface of the snout and does not partially separates internasals *Eirenis* 12



Fig. 31. Large rostrum that extends to the upper surface of the snout.

- 12 Dorsal scale rows at midbody 15 13
- Dorsal scale rows at midbody 17 15
- 13 Subcaudals, 40–72, ventrals 133–200, 7 (8) upper labials; head with 3 dark transverse and independent bands: the 1st extends across the eyes, the 2nd covers the parietal shields, the 3rd band, across the neck and often with light margin, long and clearly visible from ventral side, sometimes joined to form a collar; dorsal scales often with very small dark dots at tip *Eirenis rothi*
- Subcaudals 29–55, ventrals 118–156, transverse bands on the dorsum 14
- 14 Head with black crown (Fig. 32A) *Eirenis coronelloides*
- Head without black crown (Fig. 32B) *Eirenis coronella*

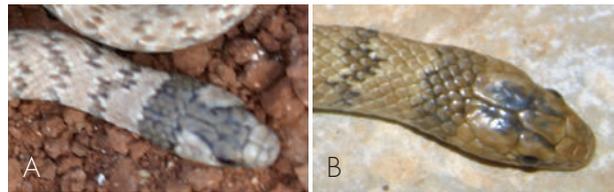


Fig. 32. A. Head with a crown (*Eirenis coronelloides*). B. Head without a crown (*Eirenis coronella*).

- 15 Subcaudals 40–83, ventrals 136–183, with two thin pairs of dark stripes running the length of body and tail, or with a uniform dorsum without stripes *Eirenis decemlineata*
- Subcaudals 32–47, ventrals 110–145, pale brown above, body pattern with brown spots arranged in 4 rows; ventral parts dotted *Eirenis lineomaculata*
- 16 Number of midbody scale rows 19 17
- Number of midbody scale rows more than 19 *Hemorrhhis nummifer*
- 17 Dorsal side with black transverse crossbars all over the body (Fig. 33A) 18
- Dorsal side without black transverse crossbars all over the body (Fig. 33B) 19

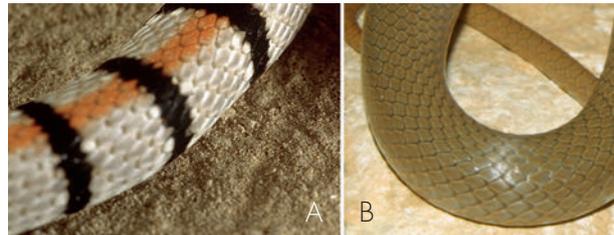


Fig. 33. A. Body with transverse crossbars. B. Body without transverse crossbars.

- 18 Crossbars on the body 20–28, and 7–13 on the tail *Platyceps elegantissimus*
- Crossbars on the body 42–51, and 20–28 on the tail *Platyceps sinai*
- 19 Neck region with a collar (Fig. 34) *Platyceps collaris*
- Neck region without a collar 20



Fig. 34. Neck region with a collar (*Platyceps collaris*).

- 20 Eight upper labials 21
- Nine upper labials 22
- 21 Body uniformly black in adults with over 100 caudal scales *Dolichophis jugularis*

- Body not uniformly black, mostly with longitudinal white stripes, caudal scales less than 100
..... *Dolichophis schmidtii*
- 22** Ventral scales fewer than 200 and caudal scales fewer than 90 *Hemorrhhois ravergeri*
- Ventral scales more than 200 and caudal scales more than 90 **23**
- 23** Fewer than 208 ventral scales ... *Platyiceps rogersi*
- More than 208 ventral scales
..... *Platyiceps rhodorachis*



Fig. 35. Adult Syrian Black Snake, *Dolichophis jugularis*, from Ar Ramthā.

Genus *Dolichophis* GISTEL, 1868

No detailed descriptions are available for this genus. Species of this genus are relatively long snakes reaching more than 2 m long, with robust bodies. Eyes large with rounded red pupils. Eight upper labials, 4th and 5th entering the eye, and nine to ten lower labials are present. Two preoculars, one subocular, and two or three postoculars. Midbody scales 19.

After the revision of the genus *Coluber* (see discussion under systematics of *Dolichophis jugularis*), two species of the genus *Dolichophis* are known from Jordan, *Dolichophis jugularis* and *Dolichophis schmidtii*.

Dolichophis jugularis (LINNAEUS, 1758)

Coluber jugularis LINNAEUS, 1758. – Syst. Nat., ed. 10, 1: p. 225. – KAHL, GAUPP & SCHMIDT, 1980. – Das Terrarium, p. 232. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 255.

Zamenis gemonensis var. *asianus* BOULENGER, 1893. – Catalogue of the Snakes in the British Museum (Natural History), 1: p. 395.

Coluber jugularis asianus DISI, 1985. – The Snake, 17: p. 35. – DISI, AMR & DEFOSSE, 1988, The Snake, 20: p. 44.

Hierophis jugularis SCHÄTTI, 1988. – Systematik und Evolution der Schlangengattung *Hierophis* FITZINGER, 1843. – Ph.D. Diss. Univ. Zürich. p. 45. – NAGY, SCHMIDTLER, JOGER & WINK, 2004, Salamandra, 39: p. 155.

Coluber (s.l.) *jugularis* VENCHI & SINDACO, 2006. – Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, 98: p. 268.

Dolichophis jugularis NAGY, BELLAAGH, WINK, PAUNOVI & KORSÓS, 2010. – Amphibia-Reptilia, 31: p. 456.

Common name. Large Whip Snake, Syrian Blacksnake.

Range. Southern Turkey, northern Iraq, Syria, Lebanon, Palestine and Jordan.

Distribution in Jordan. Fig. 36.

Material examined (N=66). *JUMR* 330, June 1978, Dibbīn. *JUMR* 331, June 1978, Burmā. *JUMR* 263, 1982, Ghawr aṣ Ṣāfī. *JUMR* 311, no date, Dayr ‘Allā. *JUMR* 330, 23 June 1978, Dibbīn. *JUMR* 334, May 1978, Ajlūn. *JUMR* 455, 1980, Wādī as Sīr. *JUMR* 461, 1979, Irbid. *JUMR* 551, 28 April 1979, Dayr ‘Allā. *JUMR* 593, 2 September 1980, Al Jubayhah. *JUMR* 599, 13 November 1980, Ayl. *JUMR* 603, 27 November 1980, Ghawr Al Wasat. *JUMR* 625, 24 March 1981, Ghawr Al Wasat. *JUMR* 708, 9 November 1981, Al Jubayhah. *JUMR* 768, 20 November 1980, Ar Ramthā. *JUMR* 796, 3 January 1982, Ar Ramthā. *JUMR* 840, October 1981, Kuraymah. *JUMR* 850, November 1982, Kuraymah. *JUMR* 867, 2 May 1982, Nā’ūr. *JUMR* 896, April 1982, Ar Ramthā. *JUMR* 920, 14 June 1982, Al’āl. *JUMR* 921, 14 June 1982, Al’āl. *JUMR* 923, 19 June 1982, Jinnīn aṣ Ṣafā. *JUMR* 1062, 14 June 1982, ‘Al’āl. *JUMR* 1143, June 1982, Aqrabā. *JUMR* 1181, 1982, Dayr Abū Sa’īd. *JUMR* 1185, 1982, Dayr Abū Sa’īd. *JUMR* 1335, May 1983, Hisbān. *JUMR* 1342, May 1983, Hisbān. *JUMR* 1367, May 1983, ‘Ayn Ghazāl. *JUMR* 1399, May 1983, Dayr Abū Sa’īd. *JUMR* 1583, May 1985, Al Jubayhah. *JUMR* 1669, April 1986, ‘Al’āl. *JUMR* 1670, April 1986, Wādī as Sīr. *JUMR* 1845, April 1987, El Muqābalein. *JUMR* 1851, January 1988, Al Mashara’. *JUMR* 1908, April 1989, Wādī as Sīr. *JUMR* 1915, no date, Yājūz. *JUMR* 1928, May 1990, Al Jubayhah. *JUMR* 1929, August 1990, Um Al Basateen. *JUMR* 2108, July 1995, Nā’ūr. *JUMR* 2132, October 1995, Shafa Badran. *JUMR* 2164, July 1995, Fuḥeis. *JUMR* 2219-2220 & 2222, no date, Al Jubayhah. *JUMR* 2328, October 1997, As Salt. *JUMR* 2331, May 1998, As Salt. *JUMR* 2443, May 1998, As Salt. *JUMR* 2574, July 1998, Dābūq. *JNHM* 0232, 14 May 1982, Ḥawwāra. *JNHM* 412, 16 October 1982, Kafr Asad. *IUSTM* 327, 18 May 1991, Hām. *IUSTM* 308, August 1994, Ar Ramthā. *IUSTM* 396, 1997, Ar Ramthā. *IUSTM* 401, 2 May 1998, Bushrā. *IUSTM* 403, 15 June 2000, Ar Ramthā. *IUSTM* 404, 3 August 2000, Ar Ramthā. *IUSTM* 408, 2001, Rihābā. *IUSTM* 412, March 2001, Ḥartā. *MUM* 0069, 16 June 1991, Ader. *MUM* 0159, 18 August 1991, Ma’an. *MUM* 0303, 13 April 1993, Mu’tah. *MUM* 0304, 17 April 1993, Al Mazār. *MUM* 0306, 6 June 1992, Rākīn. *MUM* 0505, 18 May 1991, Mu’tah.

New localities. Al Sarīḥ, Al Shajarah, Barashtā, Birqīsh, Dānā Nature Reserve, El Hamma, Jarash, Ṣuwayliḥ, Umm al Qiṭṭayn, Wādī as Sīr.

Published records. As Salt (PERACCA, 1894), Al Karak (BARBOUR, 1914), Al Jubayhah, Ar Ramthā, Ayn Ghazāl, Dibbīn, Dayr ‘Allā, Ghawr aṣ Ṣāfī, Ghawr Al Awsat, Ḥawwāra,

Table 1. Scale counts and measurements (mm) for *Dolichophis jugularis* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0159	♂	212	94	1092	940
MUM0303	♂	212	120	1400	580
MUM0306	♂	206	120	1260	560
MUM0505	♀	228	128	1400	530

Table 2. Scale counts and measurements (mm) for adult *Dolichophis jugularis* specimens at Jordan University Museum.

Character	♂			♀		
	N	Range	Av & SD	N	Range	Av & SD
VS	14	202 – 215	208.8 ± 3.71	7	207 – 216	211.4 ± 3.87
SCS	12	102 – 125	112.1 ± 15.1	5	102 – 109	107 ± 3.08
SVL	14	740 – 1450	1192 ± 21.3	7	735 – 1200	1027 ± 15.8

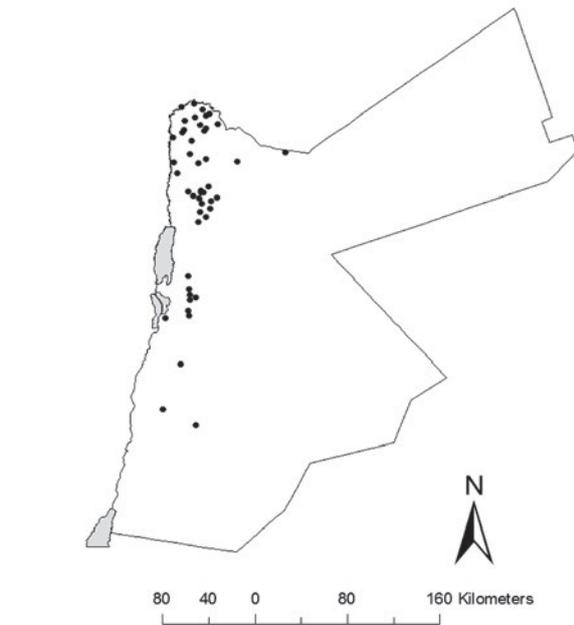
Hisbān, Irbid, Jinnīn aṣ Ṣafā, Kafr Asad, Kuraymah, Nā'ūr, Wādī as Sīr (DISI, 1985), Ader, Ma'a'n (AMR *et al.*, 1994), Al Mazār, Mu'tah, Rākīn (EL ORAN *et al.*, 1994), As Salt (SINDACO *et al.*, 1995), Ajlūn, Al Mashara', 'Al'al, 'Ammān, Dibbīn, Dayr Abū Sa'id, Ṣāfūt (DISI *et al.*, 2001), Dibbīn Nature Reserve (DAMHOUREYEH *et al.*, 2009).

Materials recorded in other museums. MZUT-R 619, Es Salt (= As Salt) (listed by PERACCA, 1896 as *C. gemonensis* var *asiana*). SMF 76535, Jordan, no date, leg. J. KLAPPERICH: ZFMK 44375, Dayr 'Allā, no date.

Systematics. SCHÄTTI (1988) assigned all the polytypic Asian forms of *D. jugularis* as well as other European species into the genus *Hierophis*. However, the fate of other Southwestern Asian *Coluber* species was unresolved. This approach seems not to be appealing for most herpetologists dealing with the *jugularis* complex (LEVITON *et al.*, 1992; FRYNTA *et al.* 1997). NAGY *et al.* (2004) introduced *Dolichophis* GISTEL, 1868 as the genus that represents the former *Coluber* for some eastern Mediterranean species. Currently, the genus *Dolichophis* has been accepted by the current authors and numerous herpetologists in the Middle East as a valid name (e.g. GÖÇMEN *et al.*, 2008).

Diagnosis. Adults are long and stout. Eyes with rounded red pupils. Eight UL, 4th and 5th entering the eye. Nine to ten LL. Two PO, one subocular, two or three PtO. MBS 19, VS 202–218, CS 103–126. Anal divided. Maximum total length may reach 250 cm. Tables 1 and 2 include scale counts and body measurements for *Dolichophis jugularis*.

Colouration. Adult specimens are uniformly black dorsally (Fig. 35). Immature differs from adult specimens in having four to six rows of alternating, light coloured spots dorsally (Fig. 37).

**Fig. 36.** Distribution of *Dolichophis jugularis* in Jordan.**Fig. 37.** Immature *Dolichophis jugularis*, from Al Sarīh.

Habitats and ecology. The Syrian Black Snake is confined to the Mediterranean biotope, although specimens were also found in transitional areas between

the Irano-Turanian and the Mediterranean biotopes. It was recovered from deserted rodent burrows and from under stones. This snake is anthropogenic; it is quite common around agricultural regions and grain storage areas. A mature specimen was found in a deep burrow that stretched over three metres. An immature specimen was found under a rock in June.

Biology. They may feed on rodents that are usually associated with farming areas. When approached this snake hisses loudly and coils itself with the head elevated. In Džanā Nature Reserve, one individual was observed climbing a tree, then stretching out to sun bathe. It was found to feed on chameleons and young chicks (AMR & DISI, 1998). A young *D. jugularis* was found ingested by *Malpolon insignitus*. GÖÇMEN *et al.* (2008) reviewed the cannibalistic behavior of this snake. Females are oviparous, laying 6–18 eggs (DISI, 2002).

Remarks. Evidently, the population of the Syrian Black Snake in Jordan differs from other populations in Syria and Lebanon; the lower lip is light-yellow, and never light reddish. The authors saw a specimen in Aleppo, Syria, with the characteristic red lower lip.

Dolichophis schmidtii (NIKOLSKY, 1909)

Coluber schmidtii NIKOLSKY 1909. – Mitt. Kaukas. Mus. Tiflis, **4**: p. 303. – DISI, AMR & DEFOSSE, 1988, *The Snake*, **20**: p. 44. – ŠČERBAK & BÖHME, 1993, *Handbuch der Reptilien und Amphibien Europas*. Band 3/I. Schlangen (serpents), p. 167. – DISI, MODRÝ, NEČAS & REFAI, 2001, *Amphibians and Reptiles of the Hashemite Kingdom of Jordan*, p. 366. – ABU BAKER, RIFAI, JOGER, NAGY, WINK & AMR, 2002, *Herpetozoa*, **15**: p. 30.

Coluber jugularis schmidtii MÜLLER, 1939. – *Zool. Anz. Jena*, **127**: p. 89.

Coluber caspius schmidtii ZINNER, 1972. – Systematics and evolution of the species group *Coluber jugularis* LINNAEUS, 1758 – *Coluber caspius* GMELIN, 1789 (Reptilia serpentes). Ph.D. Thesis, The Hebrew University, p. 51. – DISI, 1985, *The Snake*, **17**: p. 36.

Hierophis schmidtii SCHÄTTI, 1988. – Systematik und Evolution der Schlangengattung *Hierophis* FITZINGER, 1843. Ph.D. Diss. Univ. Zürich, p. 22. – ENGELMANN, FRITSCH, GÜNTHER & OBST, 1993. – *Lurche und Kriechtiere Europas*, p. 363.

Coluber (Hierophis) schmidtii GRUBER, 1989. – *Die Schlangen Europas und rund ums Mittelmeer*, p. 92.

Coluber (s.l.) schmidtii NAGY, LAWSON, JOGER & WINK, 2004. – *Journal of Zoological Systematics and Evolutionary Research*, **42**: p. 224. – VENCHI & SINDACO, 2006, *Annali del Museo Civico di Storia Naturale “G. Doria”*, Genova, **98**: p. 268.



Fig. 38. Male Schmidt's Whip Snake, *Dolichophis schmidtii* from Umm al Qiṭṭayn.



Fig. 39. Adult *Dolichophis schmidtii* from Umm al Qiṭṭayn.

Dolichophis jugularis NAGY, BELLAAGH, WINK, PAUNOVI & KORSÓS, 2010. – *Amphibia-Reptilia*, **31**: p. 456.

Common name. Schmidt's Whip Snake.

Range. Southern Caucasus, southern and eastern Turkey, northern Iran, northern Syria and Jordan.

Distribution in Jordan. Fig. 40.

Material examined (N=1). JUMR 673, Jāwá, 1981.

New localities. Umm al Qiṭṭayn.

Published records. Dayr al Kahf (DISI, 1985), Jāwá (ABU BAKER *et al.*, 2002), Riḥāb (SINDACO *et al.*, 1995).

Materials recorded in other museums. HLMD RA 2971, Jāwá, 30 August 2000, leg. M. ABU BAKER. MCC/R613, 6 km east of Riḥāb, on the road between Al Mafraq and Jarash, 26 April 1994.

Systematics. *Dolichophis schmidtii* and *Dolichophis caspius* were considered by some as subspecies of *Dolichophis jugularis* (BAŞOĞLU & BARAN, 1980; LATIFI 1991). However, BARAN (1976), ZINNER (1972) and ŠČERBAK & BÖHME (1993) considered them as separate species as do the current authors. In his treatment, SCHÄTTI (1988) assigned all the polytypic Asian forms of *D. jugularis* and other European species into the genus *Hierophis*.

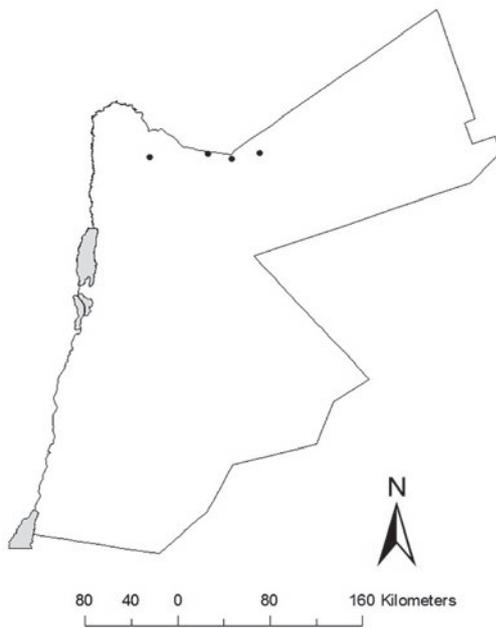


Fig. 40. Distribution of *Dolichophis schmidtii* in Jordan.

Diagnosis. Head is distinct from neck. Eye with rounded pupil. Body scales are smooth, one loreal, one and rarely two preoculars, one subocular on the front edge of the eye. UL eight and sometimes nine, 4th and 5th entering the eye. LL 9/11, first five in contact with the anterior chin shields. PO 1/1, infraocular 1/1, PtO 2/2. Anterior temporal 2/2, posterior temporal 3/3 (Fig. 41). MBS 19, VS 190–212, CS 86–107. Anal single. Maximum total length may reach 160 cm.

Colouration. This is a erythristic snake with variable colours during different stages of its life. The adult background colouration is red-brown to brick red (Fig. 38). Male's dorsum is usually brown to grey with longitudinal spots on its background (Fig. 39). The most distinctive character of this snake is the colour and background of the dorsal scales; the scale center is red and dark, the upper and lower edges are light, giving the appearance of very fine longitudinal stripes.

Immature specimens possess dark spots. In the anterior body part the spots are arranged to form a crossbar pattern. This pattern remains among juveniles up to the length of 140 cm. Ventral side is shiny coral to cherry red or pinkish. The general dorsal colouration is olive green with dark spots that extends along the entire dorsal side. Two apical pits, brown in colour, are present on each dorsal scale and are clearly visible. Scales are dark medially and light on the edges.

Habitat and Ecology. This snake has been found in a wide range of habitats in the southern states of

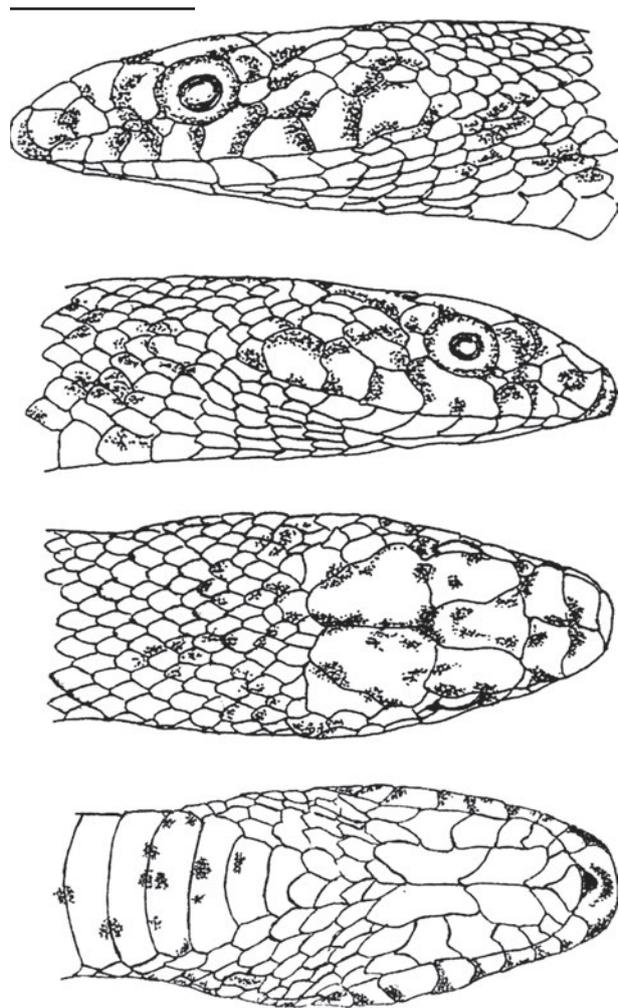


Fig. 41. Lateral, dorsal and ventral views of the head of *Dolichophis schmidtii* from Jāwá, Jordan (HLMD RA-2791). Scale bar represents 14 mm.

the former Soviet Union; it was found in plains and mountains up to 1500 m asl, river valleys, rocky slopes, mountains steppes as well as densely vegetated and semiarid to dry regions. In Syria, a specimen was collected from a corn field near Aleppo (ŠČERBAK & BÖHME, 1993). BAŞÖĞLU & BARAN (1980) stated that it inhabits areas similar to those inhabited by *Dolichophis jugularis*. Its distribution extends from the southern Caucasus, southern and eastern Turkey to northern Iran. These relict populations resulted from the glacial retraction that occurred in the region, but which left some of habitats suitable to sustain the remnant populations.

In Jordan, Jāwá is situated in Wādī Rajil at the southern tip of Jabal Al-‘Arab. The area is a basalt desert covered by black rocks of different sizes, with wadi beds, gorges and very scarce vegetation that extends southwards to Saudi Arabia (ABU BAKER *et al.*, 2002). The western-facing boulders are covered

by epilithic lichen which form a white precipitate (SEARIGHT, 1987). The annual rain fall is about 150 mm, snow may fall several times annually in the area, and its altitude is 1000 m asl.

The Schmidt's Whip Snake occur sympatrically with *P. ravergeri*, another relict species, known only from this region. Further studies should focus on the ecology of this snake. Other reptiles collected from the area include the following taxa: *Acanthodactylus tristrami*, *Laudakia stellio picea*, *Ptyodactylus pui-seuxi*, *Platyceps ravergeri*, *Pseudocerastes fieldi* and *Trapelus pallidus agnetae* (ABU BAKER *et al.*, 2002).

Biology. Very little is known about the biology of this snake in the Middle East. *Dolichophis schmidtii* seems to be an opportunistic feeder feeding on birds, small mammals, amphibians, reptiles and insects (MUS'CHELISWILI, 1970; ŠAMMAKOW, 1981; ALEKPEROW, 1978). In Azerbaijan, ATAJEV (1985) noted 10–12 specimens per ha., an unusually high density, in the tea plantation of Lenkora. *D. schmidtii* is a strictly diurnal snake, with its peak activity from March to May and in October. An extremely aggressive snake, which when cornered, can jump forward.

Remarks. The Schmidt's Whip Snake represents a relict. ZINNER (1972) indicated that central Syria may represent the most southern distribution range for this species. DISI (1985) considered *D. schmidtii* as a subspecies of *Dolichophis caspius*, however, ABU BAKER *et al.* (2002) provided molecular evidence that confirmed the separate identity of this snake compared to *D. caspius*.

Genus *Eirenis* JAN, 1863

This genus includes small-sized snakes, referred to as dwarf racers or peace. The head is small. Eyes with rounded pupils. Two internasals, nasal undivided, and one preocular. Dorsal scales are smooth and in 15 or 17 mid-body rows. This genus includes some 18 species distributed in southeastern Europe across the Arabian Peninsula. So far, five species are known to occur in Jordan, occupying diversified habitats.

So far, 16 species of this genus were reported and distributed from southern former Soviet Union States, through Iran to Pakistan eastward, to Greece, Turkey, Iran through the Levant and extending into Sinai (MARX, 1968; GASPERETTI, 1988; LEVITON *et al.*, 1992; BAHA EL DIN, 2006). Turkey has the highest number of species (SCHMIDTLER & EISELT, 1991, SCHMIDTLER, 1993, 1997). Some studies have revisited the genus *Eirenis* including DOTSSENKO (1989) who



Fig. 42. The Crowned Dwarf Snake, *Eirenis coronella*, from Ar Ramthā.

subdivided this genus into two subgenera: *Eirenis*, containing species with 17 dorsals at midbody; and *Collaria*, including species with 15 dorsals. SCHMIDTLER & EISELT (1991) argued on the validity of this revision, and stated that 17 dorsals reflects the original state of *Eirenis*, while 15 dorsals may have evolved many times in the past.

Eirenis coronella (SCHLEGEL, 1837)

- Calamaria coronella* SCHLEGEL, 1837. – *Phys. Serp.*, **2**: p. 48.
Homalosoma coronelloides JAN, 1862. – *Arch. Zool. Anat. Phys.*, p. 14.
Contia coronella BOULENGER, 1893. – *Catalogue of the Snakes in the British Museum (Natural History)*, **1**: p. 262;
Contia brevicauda NIKOLSKY, 1907. – *Annuaire du Musée Zoologique de l'Académie des Sciences de St. Petersburg*, **10**: p. 296.
Eirenis coronella SCHMIDT, 1939. – *Field Museum of Natural History, Zoology Series*, **24**: p. 79. – HAAS, 1943, *Copeia*, **1943**: p. 14. – KHALAF, 1959, *Reptiles of Iraq with Notes on the Amphibians*, p. 79. – BARAN, 1978, *Annalen des Naturhistorischen Museum, Wien*, **81**: p. 261. – GRUBER, 1989, *Die Schlangen Europas und rund ums Mittelmeer*, p. 106. – LEVITON, ANDERSON, ADLER & MINTON, 1992, *Handbook to the Middle East Amphibians and Reptiles*, p. 96. – DISI, MODRÝ, NEČAS & REFAI, 2001, *Amphibians and Reptiles of the Hashemite Kingdom of Jordan*, p. 277. – BAHA EL DIN, 2006, *A Guide to the Reptiles and Amphibians of Egypt*, p. 236. – VENCHI & SINDACO, 2006, *Annali del Museo Civico di Storia Naturale "G. Doria"*, Genova, **98**: p. 271. – EGAN, 2007, *Snakes of Arabia: A Field Guide to the Snakes of the Arabian Peninsula and its Shores*, p. 87. – SHWAYAT, DISI & AMR, 2009, *Vertebrate Zoology*, **59**: p. 92.
Eirenis coronella coronella DISI *et al.*, 1988. – *The Snake*, **20**: p. 46.
Eirenis arabica HAAS, 1961. – *Annals of the Carnegie Museum*, **36**: p. 20.

Table 3. Scale counts and measurements (mm) for *Eirenis coronella* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0058	♂	137	53	186	54
MUM0063	♀	154	48	200	46
MUM0077	♀	156	49	120	25
MUM0078	♀	142	54	165	46
MUM0095	♂	137	47	235	61
MUM0096	♀	152	51	235	58
MUM0099	♀	154	49	201	60
MUM0331	♂	145	47	195	51
MUM0332	♂	123	43	165	47
MUM0336	♂	119	40	186	51
MUM0337	♂	147	35	250	45
MUM0411	♂	127	38	165	50
MUM0432	♀	125	42	165	48

Table 4. Scale counts and measurements for *Eirenis coronella*.

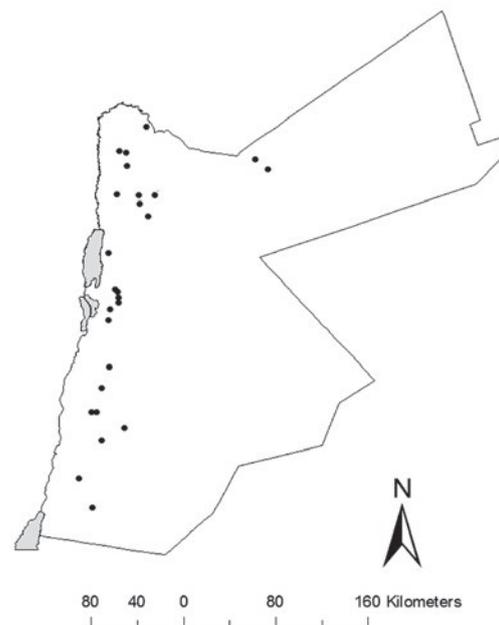
Charakter	♂			♀		
	N	Range	Av & SD	N	Range	Av & SD
VS	9	121–142	129.8±10.7	22	118–156	143.3±11.82
SCS	9	34–48	38.7±9.48	22	29–55	41.3±6.63
SVL	11	10.2–19.8	15.85±4.4	22	11–29	22.7±4.57
TL	11	1.2–4.8	3.52±1.67	22	2.1–7.5	4.4±1.26
TOL	11	12.3–27	20.51±3.98	22	13.1–36.5	24.24±5.15

Common name. Crowned Dwarf Snake, Crowned Peace Snake.

Range. Southern Turkey extending southwards to northern and northeastern Arabia, to the east crossing Iraq and western Iran (LEVITON *et al.*, 1992).

Distribution in Jordan. Fig. 43.

Material Examined (N=52). JUMR 247, 5 June 1978, 'Ib-bīn. JUMR 265, April 1979, 'Ammān. JUMR 432, March 1982, 'Ammān. JUMR 435, March 1980, 'Ammān. JUMR 856–857, 7 April 1982, 'Awjān. JUMR 888, April 1982, Ar Ramthā. JUMR 892, April 1982, Ar Ramthā. JUMR 895, April 1982, Ar Ramthā. JUMR 900, 19 May 1982, Yājūz. JUMR 907, May 1982, Jāwā. JUMR 934, 7 January 1982, Jāwā. JUMR 1144, June 1982, 'Ammān. JUMR 1148, October 1982, 'Awjān. JUMR 1208, April 1983, Saḥāb. JUMR 1211, April 1983, Saḥāb. JUMR 1212, April 1983, Saḥāb. JUMR 1216–1217, April 1983, Saḥāb. JUMR 1256, September 1982, Ar Ramthā. JUMR 1328, May 1983, Ar Ramthā. JUMR 2027, 20 April 1995, Petra. JUMR 2031, 4 May 1995, Petra. JUMR 2034, April 1995, 'Ammān. JUMR 2083, 20 April 1995, Petra. JUMR 2276, 14 October 1996, W. Safawi. JUMR 2326, 17 June 1997, Dānā. JNHM 338, 15 May 1994, Al Karak. JNHM 339, no date, Dānā. JNHM 78, 12 June 1991, Wādī Mūsá. JNHM 96, 11 July 1991, El Quweira. JNHM 337, 8 May 1993, Al Karak. JUSTM 111, no date, Al Mafrāq. JUSTM 112, no date, Jordan Valley. JUSTM 113, no date, As Salt. JUSTM 132, 15 May 1995, Saḥāb. JUSTM 410, 2001, Rihābā. JUSTM 419, July 2002, Faqqū'. MUM 0058 & 77–78, 12 June 1991,

**Fig. 43.** Distribution of *Eirenis coronella* in Jordan.

Wādī Mūsá. MUM 0063, 12 June 1991, Ash Shawbak. MUM 0095–96 & 99, 11 July 1991, El Quweira. MUM 0331, 2 May 1993, Aṭ Ṭayyibah. MUM 0332 & 337, 22 May 1993, Kathrabbā. MUM 0336, 20 May 1991, Rākīn. MUM 0395, 23

July 1993, Wādī Ibn Hammad. MUM 0411, 13 July 1993, 'Ai. MUM 0432, 22 May 1993, Kathrabbā.

New localities. Mekawer, Petra.

Published records. Petra (BARBOUR, 1914), between Ma'an and Sisah (= Jīza) (HAAS, 1943), Ar Ramthā, 'Ammān, 'Awjān, Ibbīn, Jāwā, Saḥāb, Yājūz (DISI *et al.*, 1988), Al Muraygha, Ash Shawbak, El Quweira, Wādī Mūsā (AMR *et al.*, 1994), Ash Shawbak, Aṭ Ṭayyibah, 'Ai, El Quweira, Kathrabbā, Rākīn, Wādī Ibn Hammad, Wādī Mūsā (EL ORAN *et al.*, 1994), Jāwā (DISI *et al.*, 1999), Wādī Ramm (ABU BAKER *et al.*, 2004), Al Karak, 'Ammān, Ar Ramthā, As Salt, 'Awjān, Az Zarqā', Ḍānā, El Quweira, Ibbīn, Jāwā, Petra, Saḥāb, Wādī Mūsā, W. Safawī (SHWAYAT *et al.*, 2008).

Materials recorded in other museums. HUJ-R 3138, Sisa (= Jīza)-'Ammān, 28 March 1936, *leg.* G. HAAS. HUJ-R 3141, Aqaba, April 1936, *leg.* G. HAAS. HUJ-R 3148, Sisa (= Jīza)-W. Musa (Wādī Mūsā), 1936, *leg.* G. HAAS. HUJ-R 16968, 'Ammān-Catarana (= Al Qaṭrānah), 28 March 1936, *leg.* G. HAAS. MCZ R-9682 & 9684, January 1914–31 December 1914, Petra, *leg.* J. C. PHILLIPS & W. M. MANN.

Systematics. Although SCHMIDTLER & SCHMIDTLER (1978) and ARNOLD (1982) disputed the systematic status of *Eirenis coronella fraseri*, LEVITON *et al.* (1992) considered this subspecies as a synonym for *E. c. coronella*.

Diagnosis. Small snake with cylindrical body. Eyes are small with rounded pupils. One loreal, one PO, two PtO, 1+2 temporals. Seven UL, 3rd and 4th entering the eye. Seven to eight LL, four are in contact with the anterior chin shields. MBS are in 17–19 rows (Fig. 42). VS 118–156, CS 29–55. Subcaudal and anal scales are divided. Maximum total length may reach 35 cm. Tables 3 and 4 include scale counts and body measurements for *Eirenis coronella*.

Colouration. Generally specimens have grey background colour to yellow-brown in some instances, with dark spots forming thin transverse bands. A light to dark brown collar is present. The ventral side is usually yellow with small round spots.

Habitats and ecology. Generally, this snake is quite common in semiarid regions. Most of its known distribution is confined to the Irano-Turanian belt around the Mediterranean biotope, and in steppe regions of the Mediterranean. This snake was collected from under rocks in semiarid areas and among dense vegetation in Ḍānā Nature Reserve.

Biology. SHWAYAT *et al.* (2008) recovered spiders, scorpions and centipedes from the stomachs and intestines of this snake. It seems that this snake is insectivorous in most of its stages. A specimen collected from Ḍānā Wildlife Reserve laid five eggs in July (SHWAYAT *et al.*, 1998). Not much is known

about its biology in Jordan or elsewhere in the region.

Remarks. SHWAYAT *et al.* (2008) found that specimens collected from southern Jordan had higher scale counts (Ventrals 136–156, subcaudals 35–55) compared with specimens collected from northern parts of the country (Ventrals 118–124, subcaudals 29–44).

Eirenis coronelloides (JAN, 1862)

Homalosoma coronelloides JAN, 1862. – Anat. Phys., **2**: p. 34.
Eirenis coronelloides SIVAN & WERNER, 2003. – Zoology in the Middle East, **28**: p. 39. – SCHÄTTI & MONSCH, 2004, Revue Suisse de Zoologie, **111**: p. 240. – SHWAYAT, DISI & AMR, 2009, Vertebrate Zoology, **59**: p. 91.
Eirenis (Pediophis) coronelloides NAGY, SCHMIDTLER, JOGER & WINK. – 2003, Salamandra, **39**: p. 152.

Common name. not designated.

Range. Egypt, Jordan, Palestine, Syria, Iraq and Turkey (SIVAN & WERNER, 2003).

Distribution in Jordan. Fig. 45.

Material examined (N=1). JUJTM 295, 25 November 1994, Al Mafrāq.

Published records. 'Ammān, Sisa (= Jīza), Al Mafrāq, Jabal al Ashāqif, N of Zarka (= Az Zarqā') (SIVAN & WERNER, 2003).

Materials recorded from other museums. BMNH 1927.816.6, 'Ammān. FMNH 19577, no date, (Al Mafrāq) Transjordan, *leg.* H. FIELD & R. A. MARTIN. FMNH 19582, 14 May 1934, (Jabal al Ashāqif) Transjordan, *leg.* H. FIELD & R. A. MARTIN. HUJ-R 3145, 'Ammān-Catrane (= Al Qaṭrānah), 1936, *leg.* G. HAAS. HUJ-R 3146, Sisa (=Jīza). HUJ-R 16967, Sisa (= Jīza)-'Ammān, 28 March 1936, *leg.* G. HAAS. HUJ-R 3143, N Zarka (= Az Zarqā'), March 1943. HUJ-R 16976, near 'Ammān, April 1986.

Systematics. SIVAN & WERNER (2003) revised materials that were considered as *E. coronella* in the Middle East. They concluded that specimens with dark crown, ventral stripe or both should be considered as *Eirenis coronelloides*.

Diagnosis. Head not distinct from neck. Black collar and crossbars are present. Black crown and a dark ventral stripe or both are present. Seven UL, eight LL, one PO, two PtO. VS 131, CS 38–89, average subcaudal scales in males about 41 and 36 in females. MBS in 15 rows. Black collar and cross bands are present. Maximum total length may reach 30 cm.

Colouration. Body light brown, with distinct dark crown on the head (Fig. 44). 52 dark dorsal bars.



Fig. 44. *Eirenis coronelloides* from Az Zarqā'.

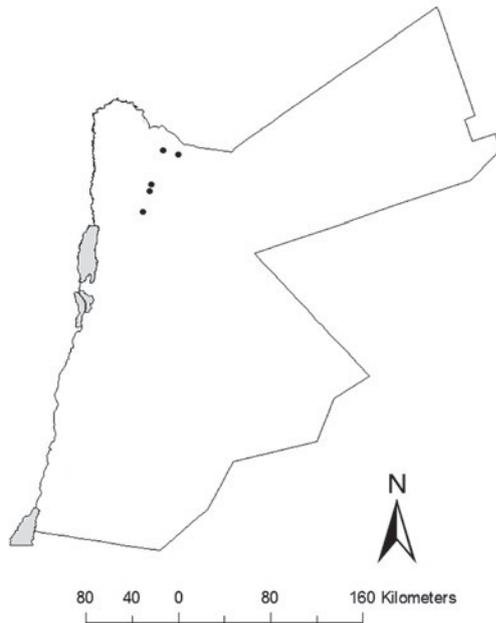


Fig. 45. Distribution of *Eirenis coronelloides* in Jordan.

Habitats and ecology. Based on its distribution, this snake is mainly confined to the arid Mediterranean ('Ammān) and the Irano-Turanian biotopes (Az Zarqā' and Al Mafrāq).

Biology. No data are available on the biology of this snake in the Middle East.

Remarks. SIVAN & WERNER (2003) revised the status of *Eirenis coronella* in the Middle East, employing principal coordinate analysis. They recognized two main groups assigned as: *Eirenis coronella*, for specimens from Sinai, Palestine, western Saudi Arabia, Jordan, Iraq and Syria, and *E. coronelloides*,

characterized by dark crown, ventral stripe or both in all specimens examined from Turkey and some specimens examined from Jordan, Iraq and Syria. Specimens from Al Mafrāq, Jabal al Ashāqif and reported by SCHMIDT (1939) at the Field Museum of Natural History were re-examined by SIVAN & WERNER (2003) and proved to be *E. coronelloides*.

***Eirenis decemlineata* (DUMÉRIL, BIBRON & DUMÉRIL, 1854)**

Ablabes decem-lineatus DUMÉRIL, BIBRON & DUMÉRIL, 1854. – Erp. Gene., p. 327.

Contia decemlineata CORKILL, 1932. – Snakes and Snake Bite in Iraq, p. 19.

Eirenis decemlineata SCHMIDT, 1939. – Field Museum of Natural History, Zoology Series, **24**: p. 80. – KHALAF, 1959, Reptiles of Iraq with Notes on the Amphibians, p. 80. – WERNER, 1971, Bulletin of the British Museum (Natural History), Zoology, London, **21**: p. 155. – BERGER-DELL' MOUR, 1986, Annalen des Naturhistorischen Museums in Wien, **87**: p. 64. – DISI, AMR & DEFOSSÉ, 1988, The Snake, **20**: p. 46. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 107. – LEVITON, ANDERSON, ADLER & MINTON, 1992, Handbook to the Middle East Amphibians and Reptiles, p. 96. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 279. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale "G. Doria", Genova, **98**: p. 272. – SHWAYAT, DISI & AMR, 2009, Vertebrate Zoology, **59**: p. 94.

Common name. Narrow-striped Dwarf Snake

Range. Turkey, Syria, Lebanon, Palestine, Jordan extending to Iraq and Iran.

Distribution in Jordan. Fig. 47.

Material examined (N=65). JUMR 134–135, 19 April 1978, Şakhrāh. JUMR 137, 18 April 1977, Ajlūn. JUMR 250, 1 May 1978, 'Ibbīn. JUMR 254 & 256-257, 17 May 1978, 'Ibbīn. JUMR 316, 3 June 1978, 'Ibbīn. JUMR 358, November 1978, JUMR 459, 1979, Kufrijā. JUMR 866, April 1998, Jinnīn aş Şafā. JUMR 1124, August 1981, Ḥartā. JUMR 1129, August 1981, Ḥartā. JUMR 1146, 1982, Irbid. JUMR 1163–1164, 1982, Dayr Abū Sa'id. JUMR1167-1168, 1982, Dayr Abū Sa'id. JUMR 1174, 1982, Dayr Abū Sa'id. JUMR 1178, 1982, Dayr Abū Sa'id. JUMR 1179, 1982, Dayr Abū Sa'id. JUMR 1182, 1982, Dayr Abū Sa'id. JUMR 1273, May 1983, Dayr Abū Sa'id. JUMR 1274, May 1983, Dayr Abū Sa'id. JUMR 1285, May 1983, Dayr Abū Sa'id. JUMR 1286, May 1983, Dayr Abū Sa'id. JUMR 1297, May 1983, Dayr Abū Sa'id. JUMR 1847, May 1987, Kafr al Mā'. JUMR 1923, 1989, Jordan Valley. JUMR 2021, 5 October 1997, 'Ammān. JUMR 2029, May 1995, Tabarbaur. JUMR 2030, October 1993, Salīhī. JUMR 2033, November 1992, Wādī as Sīr. JUMR 2038, 1995, Irbid. JUMR 2040, March 1996, Irbid. JUMR 2045, 22 October 1994, Az Zarqā'. JUMR 2322, 19 October 1997, Jarash. JUMR 2324, 7 September 1997, Jarash. INHM



Fig. 46. The non-striped form of *Eirenis decemlineata* from 'Aqrabā.

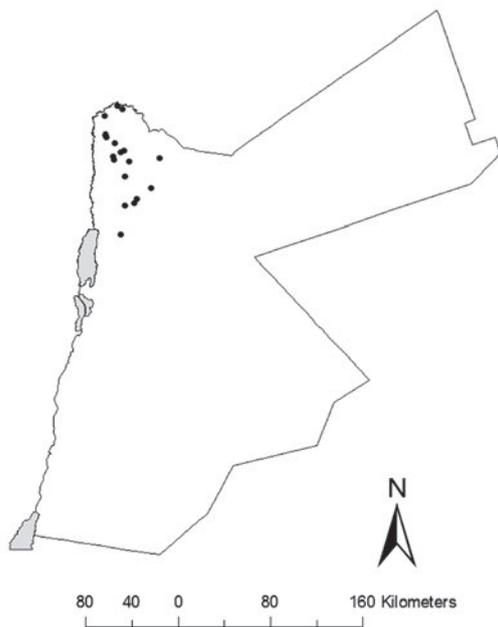


Fig. 47. Distribution of *Eirenis decemlineata* in Jordan.

43, no date, Um Qeis. *JNHM* 115, no date, Irbid. *JNHM* 365, 17.7.1982, Şakhrāh. *JNHM* 439, 1979, Irbid. *JNHM* 520, 16 April 1984, Irbid. *JNHM* 524, 18 April 1984, Irbid. *JNHM* 528, April 1983, Irbid. *JNHM* 529, no date, Irbid. *JNHM* 636, June 1983, 'Ibbīn. *JNHM* 705, 15 October 1983, Al Mazār Al Shamali. *JNHM* 719, March 1983, Aidūn. *JNHM* 1145, no date, Irbid. *JNHM* 1151, May 1996, Irbid. *JNHM* 1152, May 1996, Irbid. *JNHM* 1153, no date, Irbid. *JNHM* 1158, May 1996, Irbid. *JUSTM* 108, no date, Irbid. *JUSTM* 135, June 1995, Irbid. *JUSTM* 136, June 1995, Irbid. *JUSTM* 137, June 1995, Irbid. *JUSTM* 220, 7 April 1993, Zūbiyā. *JUSTM* 239, no date, Irbid. *JUSTM* 283, no date, Şakhrāh. *JUSTM* 325, 1993, 'Aqrabā. *JUSTM* 397, 1997, Zabdah. *JUSTM* 402, 22 February 1999, Irbid. *JUSTM* 411, 2001, Rihābā.

New localities. Birqiṣh, Khelda, Thaghṛat Asfoor.

Published records. Ajlūn, Al-Korah, 'Ammān, 'Anjara, Dayr Abū Sa'īd, Ḥartā, 'Ibbīn, Irbid, Mādabā, Şakhrāh (DİSİ *et al.*, 1988), 'Ammān, 'Aqrabā, Az Zarqā', Dayr Abū Sa'īd, 'Ibbīn, Irbid, Jordan Valley, Jarash, Şakhrāh, Um Qeis, Zūbiyā (SHAWYAT *et al.*, 2008).



Fig. 48. The striped form of *Eirenis decemlineata*, from Birqiṣh.

Materials recorded in other museum. ZFMK 44377–44378, Dayr Abū Sa'īd. ZFMK 85985–986, Jordan (not a specified locality).

Systematics. NAGY *et al.* (2003) placed *Eirenis decemlineata* within the subgenus *Eoseirenis*, and showed close relationships with *Eirenis quadrilineata*.

Diagnosis. The neck is distinct from the body. Seven UL, 3rd and 4th entering the eye, eight LL, the 4th in contact with the anterior chinshield. One loreal, one PO and two PtO, six scales around the eye. Dorsal scales in 17 rows at mid body. Anal and subcaudals divided. Maximum total length may reach 65 cm. Tables 5 and 6 include scale counts and body measurements for *Eirenis decemlineata*.

Colouration. Body is brown above, uniform or with two thin, dark stripes running the length of the body and tail. Lower parts uniform white. Two forms of the Narrow-striped dwarf snake may occur in the same habitat; one with longitudinal lines (Fig. 48) and the other with gray dorsum void of lines (Fig. 47).

Habitats and ecology. The Narrow-striped Dwarf Snake is confined to the Mediterranean ecozone of Jordan. It is usually associated with thick vegetation and forested areas. CLARK & CLARK (1973) gave a similar habitat description in Turkey. In Jordan, the 'Aqrabā area, it was found in natural oak forests and around cultivated land.

Biology. It seems that its diet is strictly insectivorous, including grasshoppers, caterpillars and spiders (SHWAYAT *et al.*, 2008). The Narrow-striped Dwarf Snake is a very quiet and peaceful snake. It could be handled easily. However, in captivity it is very diffi-

Table 5. Scale counts and measurements for *Eirenis decemlineata*.

Specimen No.	Sex	MBS	VS	CS	SVL	T
JUMR 1129	♀	17	174	70	390	139
JUMR 1163	♀	17	173	75	200	65
JUMR 1164	♀	17	172	73	185	60
JUMR 1174	♀	17	169	71	480	165
JUMR 1178	♀	17	176	79	400	140
JUMR 1179	♀	17	173	78	465	160
JUMR 1182	♀	17	169	79	300	110
JUMR 1273	♀	17	165	70	300	100
JUMR 1285	♀	17	180	77	400	136
JUMR 1286	♀	17	174	73	465	140
JUMR 2322	♀	17	175	71	170	50
JUMR 250	♂	17	168	75	420	155
JUMR 254	♂	17	171	75	440	147
JUMR 300	♂	17	170	73	355	110
JUMR 304	♂	17	168	74	390	150
JUMR 316	♂	17	164	79	310	120
JUMR 571	♂	17	167	68	365	107
JUMR 1274	♂	17	183	80	430	160
JUMR 1297	♂	17	176	76	500	180
JUMR 1923	♂	17	163	75	275	100
JNHM 43	♀	17	162	67	300	95
JNHM 1151	♀	17	168	73	160	50
JNHM 1152	♀	17	172	75	450	144
JNHM 439	♂	17	161	72	355	118
JNHM 529	♂	17	165	83	395	145
JNHM 1145	♂	17	174	81	405	155
JNHM 1153	♂	17	172	76	465	160
JUSTM 239	♂	17	161	68	500	150
JUSTM 283	♂	17	156	66	330	120
JUSTM 325	♂	17	163	63	470	145

Table 6. Summary for scale counts and measurements for *Eirenis decemlineata*.

Charakter	♂			♀		
	N	Range	Av & SD	N	Range	Av & SD
VS	23	136–183	165.7±9.31	17	168–180	172.8±4.97
SCS	23	66–83	73.9±5.18	17	40–79	73.3±3.84
SVL	23	27.5–51.5	41.1±6.53	17	16–22	33.1±10.68
TL	23	5–18.4	13.9±2.23	17	5–16.5	10.7±4.07
TOL	23	21–64.5	54.5±8.17	17	37.5–68	41.6±16.45

cult to feed. A captive specimen was fed on grasshoppers and small cockroaches.

Remarks. Jordan represents the southernmost range of distribution. Both forms, the striped and non-striped forms can be found within the same habitat. This form is not linked to sexual dimorphism, but rather it seems to be a genetic feature. In the Golan Heights in Syria, BERGER-DELL'MOUR (1986) collected the unstriped form only.

Eirenis lineomaculata SCHMIDT, 1939

Eirenis lineomaculatus SCHMIDT, 1939. – Field Museum of Natural History, Zoology Series, **24**: p. 80. – WELCH, 1983, Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphisbaenia, Sauria and Serpentes, p. 75. – DISI, AMR & DEFOSSE, 1988. The Snake, **20**: p. 46. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 110. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale „G. Doria“,

Table 7. Scale counts and measurements (mm) for *Eirenis lineomaculata*.

Specimen No.	Sex	VS	CS	SV	T
JUMR 858	nd	135	32	95	15
JUMR 919	♂	115	39	168	40
JUMR 122	♀	126	33	200	32
JUMR 162	♂	119	37	162	42
JUMR 2331	♀	132	29	250	42
MUM 281	♀	141	33	180	35
MUM 432	♂	123	41	160	48
JUSTM 374	♀	145	47	220	50
JUSTM 275	♂	110	33	175	45

Table 8. Scale counts and measurements for *Eirenis lineomaculata*.

	♂			♀		
	N	Range	Av & SD	N	Range	Av & SD
VS	4	110–123	116.8±5.56	4	126–145	136±8.6
SCS	4	33–41	37.5±3.41	4	29–47	35.3±8.01
SVL	4	15–17.5	16.2±1.03	4	15.5–25	20.13±4.21
TL	4	4.2–4.8	4.5±0.24	4	3.2–5	3.98±0.8
TOL	4	19.2–22.3	20.68±1.04	4	18.7–30	24.1±4.84

**Fig. 49.** The Striped Dwarf Snake, *Eirenis lineomaculata* from Thaghrat Asfoor.

Genova, **98**: p. 272. – SHWAYAT, DISI & AMR, 2009, Vertebrate Zoology, **59**: p. 95.

Common name. Striped Dwarf Snake

Range. Southern Turkey, Iraq, Syria, Lebanon, Palestine and Jordan.

Distribution in Jordan. Fig. 50.

Material examined (N=18). JUMR 122, June 1978, Dibbīn. JUMR 162, 3 May 1978, Şuwayliḥ. JUMR 858, 12 April 1982, Az Zarqā'. JUMR 919, 16 May 1992, Māḥiṣ. JUMR 1192, March 1983, Irbid. JUMR 1222, no date, Irbid. JUMR 2040, March 1996, Irbid. JUMR 2330, no date, 'Ammān. JUMR 2331, 22 April 1998, Irbid. JUSTM 037, no date, Irbid. JUSTM 275, no date, Irbid. JUSTM 295, 29 Februaury 1994,

Al Mafraq. JUSTM 338, 24 April 1995, Jordan Valley. JUSTM 397, 1997, Zabdah. JUSTM 415, 28 May 2001, Kafr Khal. MUM 280–281, 8 May 1994, Mu'tah. MUM 432, 22 May 1993, Al Karak.

New localities. Abū Nuṣayr, Thaghrat Asfoor.

Published records. Az Zarqā', Dayr Abū Sa'īd, Ḥabaka, Māḥiṣ, Şuwayliḥ (Disi, 1985; Disi *et al.*, 1988), Al Karak, Al Mafraq, 'Ammān, Şuwayliḥ, Irbid, Jordan Valley, Māḥiṣ, Mu'tah, (SHAWYAT *et al.*, 2008).

Materials recorded in other museums. HUJ-R 3529, SE of Jarash, 21 Februaury 1945, leg. J. H. HOOFIEN.

Systematics. This species was originally described from the Jordan Valley (SCHMIDT, 1939).

Diagnosis. Rostral as deep as broad or a little broader than deep, just visible from above. Nasal undivided; suture between the internasals as long as or a little shorter than that between the prefrontals. Frontal narrow, at least twice as long as broad, not broader than the supraocular, as long as or a little longer than its distance from the end of the snout, shorter than the parietals. Loreal considerably longer than deep. One (rarely two) pre- and two PtO. Temporals 1 + 2 or 1 + 3. Seven UL, 3rd and 4th entering the eye. Four, rarely five, LL in contact with the anterior chin-shields; posterior chin-shields as long as or a little shorter than the anterior and in contact with each other. Scales in 17 rows, VS 110–145; CS 29–44. Anal divided. Maximum total length may reach 30 cm. Tables 7 and

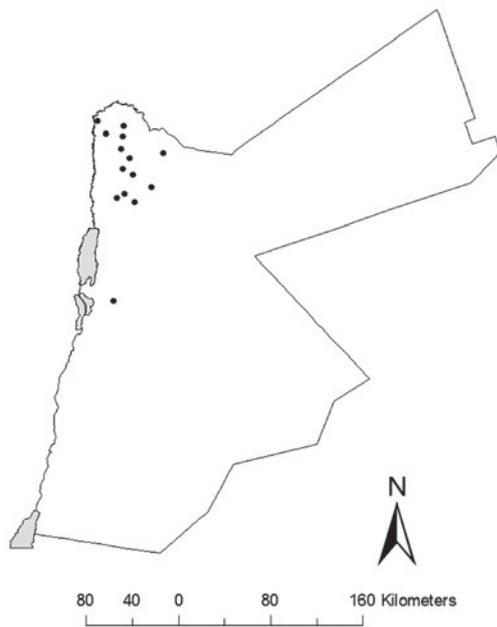


Fig. 50. Distribution of *Eirenis lineomaculata* in Jordan.

8 include scale counts and body measurements for *Eirenis lineomaculata*.

Colouration. Dorsal side is usually pale brown, with four rows of dark brown spots. Each scale in these spots has a light median shaft bordered by dark pigment stronger than the other spots, producing a sharply lineate appearance (Fig. 49). Nuchal collar is well marked and extends obliquely forward to the first ventral, narrowing below and not connected on the throat. Obscure dark markings on the head scales. Ventral side is usually lighter uniform yellowish-brown (SCHMIDT, 1939).

Habitats and ecology. *Eirenis lineomaculata* inhabits densely forested areas in northern Jordan. It is usually found under stones or among decaying oak leaves. Like for *E. decemlineata*, Jordan represents its southernmost range of distribution.

Biology. One specimen of *Scorpio maurus fuscus* was found in the stomach of striped a Striped Dwarf Snake (SHWAYAT *et al.*, 2008).

Remarks. This species was originally described from the Jordan Valley, Palestine (SCHMIDT, 1939). It differs from *E. coronella* by having 17 rows of scales and lower number of ventrals. Also, the loreal is absent and dorsal spots are arranged in alternate longitudinal dashes (SCHMIDT, 1939).



Fig. 51. Roth's Dwarf Snake, *Eirenis rothi*, from Jarash.

Eirenis rothi JAN, 1863

Eirenis rothi JAN, 1863. – Arch. Zool. Anat. Phys. p 259. – BARAN, 1978, Annalen des Naturhistorischen Museums in Wien, **81**: p. 264. – DISI, AMR & DEFOSSE, 1988, The Snake, **20**: p. 45. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 116. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 285. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 275. – SHWAYAT, DISI & AMR, 2009, Vertebrate Zoology, **59**: p. 96.

Common name. Roth's Dwarf Snake.

Range. Coastal regions of the eastern Mediterranean, from Palestine up to southern Turkey.

Distribution in Jordan. Fig. 52.

Materials examined (N=64). JUMR 104, April 1978, Şakhrāh. JUMR 166, April 1983, ‘Ammān. JUMR 182, April 1983, Umm Al Ḍānānir. JUMR 367, September 1980, Al Jubayhah. JUMR 444, May 1988, Aṭ Ṭāfila. JUMR 467, 1979, Şakhrāh. JUMR 632, 12 May 1981, Al’al. JUMR 872, May 1982, Şuwayliḥ. JUMR 1124, 10 April 1982, ‘Ammān. JUMR 1158, 10 February 1983, Ajlūn. JUMR 1365, April 1983, ‘Ammān. JUMR 1334, April 1983, ‘Ammān. JUMR 1347, April 1983, Umm Al Ḍānānir. JUMR 1364, April, 1983, ‘Ammān. JUMR 1325, May 1983, Ar Ramthā. JUMR 1329, May 1983, Ar Ramthā. JUMR 1362, June 1983, Mādabā. JUMR 1590, 23.9.1983, ‘Ammān. JUMR 1596, 18 May 1985, Jarash. JUMR 1667, April 1986, ‘Ammān. JUMR 1843a, November 1986, As Salt. JUMR 1843b, November 1986, As Salt. JUMR 1876, April 1988, Jīza. JUMR 1867, 21 February 1988, Wādī Al Muḡib. JUMR 1873, 5 April 1988, Dābūq. JUMR 1904, April, 1989, Yājūz. JUMR 1913, 15 September 1989, Yājūz. JUMR 2035, no date, Irbid. JUMR 2037, October 1995, ‘Ammān. JUMR 2037, April 1996, As Salt. JUMR 2041, 20 May 1996, As Salt. JUMR 2042, 15 June 1992, Salīhī. JUMR 2043, April 1993, Marsa’. JUMR 2044, 18 July 1995, As Salt. JUMR 2095, 15 April 1993, As Salt. JUMR 2325, March 1998, Aṭ Ṭāfila. JUMR 2327, Novem-

Table 9. Scale counts and measurements (mm) for *Eirenis rothi* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0073	♂	190	70	245	64
MUM0105	♀	188	49	275	61
MUM0330	♀	185	48	250	52
MUM0345	♂	181	55	207	52
MUM0346	♀	171	50	179	47
MUM0361	♂	181	53	208	47
MUM0362	♂	183	62	286	78
MUM0405	♂	159	54	115	22
MUM0435	♀	189	59	256	65
MUM0437	♂	170	56	185	48

Table 10. Scale counts and measurements (mm) for *Eirenis rothi* specimens from other museums.

Specimen No.	Sex	MBS	VS	CS	SVL	T
JUMR 182	♀	15	192	62	195	55
JUMR 1325	♀	15	186	57	206	53
JUMR 1365	♀	15	192	57	192	42
JUMR 166	♀	15	193	59	220	56
JUMR 1867	♀	15	200	57	247	65
JUMR 1873	♀	15	192	55	245	62
JUMR 1913	♀	15	171	62	150	40
JUMR 2042	♀	15	190	62	212	56
JUMR 2095	♀	15	174	59	240	60
JUMR 2329	♀	15	172	51	220	58
JUMR 444	♂	15	NT	63	210	65
JUMR 632	♂	15	171	65	241	80
JUMR 1124	♂	15	176	59	205	60
JUMR 1137	♂	15	179	63	300	81
JUMR 1158	♂	15	172	58	210	57
JUMR 1329	♂	15	180	69	202	55
JUMR 1334	♂	15	178	50	260	60
JUMR 1347	♂	15	171	65	181	51
JUMR 1362	♂	15	174	53	265	70
JUMR 1364	♂	15	182	59	167	46
JUMR 1596	♂	15	172	72	220	70
JUMR 1411	♂	15	173	54	205	55
JNHM 1150	♂	15	176	59	276	74
JNHM 1157	♂	15	174	54	240	60
JUSTM 92	♀	15	185	60	165	40
JUSTM 104	♀	15	189	50	260	59
JUSTM 217	♂	15	NT	65	213	65
JUSTM 389	♂	15	178	57	188	50

ber 1996, As Salt. JUMR 2329, March 1998, Aţ Tafila. JUMR 2332, 1 June 1998, Safawi. JUMR 2376, April 1992, Ghawr Al Wasat. JUMR 2405, March 1993, Salhi. JNHM 1150, no date, Irbid. JNHM 1156, no date, Irbid. JNHM 1157, no date, Irbid. JUSTM 021, 1991, Al Mafraq. JUSTM 132, no date, Saḥāb. JUSTM 217, 17 April 1993, Ar Ramthā. JUSTM 267, 24 April 1994, Zabdah. JUSTM 292, April 1991, Irbid. JUSTM 297, April 1991, Irbid. JUSTM 365, 6 May 1995, Irbid. JUSTM 389,

4 August 1995, Irbid. MUM 0059, 12 June 1992, Wādī Mūsá. MUM 0073, 1991, Ar Rājif. MUM 0104, 1991, Ash Shawbak. MUM 0105, 12 April 1991, El Ghoweir. MUM 0330, 17 May 1993, Al Mazār. MUM 0345, 14 May 1993, Mu'tah. MUM 0346, 14 June 1993, Al Adnaneyha. MUM 0361, 21 September 1992, Mu'tah. MUM 0362, May 1992, Ar-Rabba. MUM 0405, 1992, Mu'tah. MUM 0435, August 1993, El Ghoweir. MUM 0437, 14 April 1993, Al Adnaneyha.

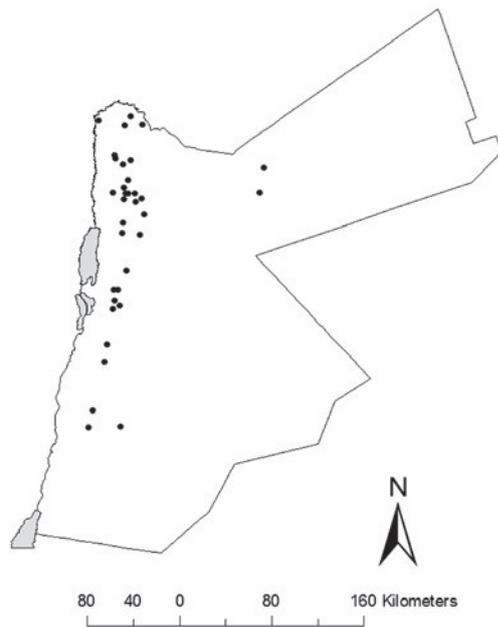


Fig. 52. Distribution of *Eirenis rothi* in Jordan.

New localities. Biqaweyeh, Jarash, Tabarbor.

Published records. Es Salt (= As Salt) (PERACCA, 1896), Ayl, 'Ayn Laḥz, ah, 'Ayn Ghazāl, Al Jubayhah, Ajlūn, 'Ammān, 'Anjarah, Ar Ramthā, As Salt, Dayr Abū Sa'id, Ḥisbān, Irbid, Ma'an, Mādabā, Ṣuwayliḥ, Umm Al Ḍānānir (DISI *et al.*, 1988), Al Karak, Ayl, Ar Rājif, Wādī Mūsā (AMR *et al.*, 1994), Al Adnanehya, Al Mazār, Ar Rabba, Ash Shawbak, Jīza, El Ghoweir, Mut'ah, Wādī Mūsā (EL ORAN *et al.*, 1994), As Salt (SINDACO *et al.*, 1995), Az Zarqā', Ḍānā, Wādī al Ḥashād (DISI *et al.*, 2001), 'Ammān (DISI *et al.*, 2004), Al'al, 'Ammān, Ajlūn, Ar Ramthā, As Salt, Aṭ Ṭafila, Hashemia, Jarash, Jīza, Irbid, Mādabā, Mu'tah, Safawī, Saḥāb, Salihī, Umm Al Ḍānānir, Wadi Mujib, Yājūz, (SHWAYAT *et al.*, 2008), Dibbīn (DAMHOUREYEH *et al.*, 2009).

Materials recorded in other museums. MZUT-R1036, Es Salt (= As Salt). (Assigned by PERACCA (1896) as *Homalosoma collaris* and re-examined by SINDACO *et al.*, 1995). HUI-R 21268, Jerash, 21 November 1945, leg. G. HAAS & J. H. HOOFIEN. HUI-R 21002, 10 km NE of Al Zarqa (Az Zarqā'), March 1996, leg. A. NEVO. SMF 76166, 'Ammān, no date, leg. J. KLAPPERICH. ZFMK 21023, Ajlūn. ZFMK 44379, East Ṣuwayliḥ. ZFMK 44380, 'Ammān. Al Adnanehya.

Systematics. As discussed for the genus.

Diagnosis. Rostral much broader than deep, just visible from above. Nasal undivided, suture between the internasals as long as or shorter than that between the prefrontals. Frontal not once and a half as long as broad, as long as or longer than its distance from the end of the snout, shorter than the parietals. Seven UL, 3rd and 4th entering the eye. Seven lower labials, four LL in contact with the anterior chin-shields. Posterior chin-shields smaller and in contact with each other. Loreal very small, longer than deep. One pre-

and two PtO. Temporals 1 + 1. Scales in 15 rows, VS 133–200; CS 40–72. Anal divided. Maximum total length may reach 35 cm. Tables 9 and 10 include scale counts and body measurements for *Eirenis rothi*.

Colouration. Brownish-yellow above; head and nape black, with three or four yellow transverse lines; the black of the nape descending to the sides of the throat; lower parts uniform white. Three dark bands on top of the head (Fig. 51).

Habitats and ecology. This species inhabits both the Mediterranean and the Irano-Turanian biotopes of Jordan.

Biology. This species was found to feed on the centipedes, *Scolopendra* sp. (SHWAYAT *et al.*, 2008). The land snail, *Xeropicta vestalis joppensis* was found in its faecal pellet (MIENIS, 1993).

Remarks. The distribution range of the Roth's Dwarf Snake extends from Turkey in the north across Syria and Lebanon to reach its most southern range in Jordan and Palestine. This species inhabits both the Mediterranean and the Irano-Turanian biotopes of Jordan. *E. rothi* has a wider range of distribution than any other species of this genus in Jordan. Examining both pholidosis and measurements of *E. rothi* from Jordan suggests sexual dimorphism. Females attain larger body size, but their tails are shorter than those of males. Accordingly, the ventral scales are 171–200 in females, while 133–182 in males. Moreover, the subcaudal scale counts are 50–62 for females and 40–72 in males (SHWAYAT *et al.*, 2008).

Genus *Hemorrhoidis* BOIE, 1826

Hemorrhoidis hippocrepis was the type species for this genus. Members of this genus are large stout snakes. Head is flat and noticeably distinct from neck with various ornamentation. Eyes with rounded pupils. Eight to nine upper labials, 5th and 6th entering the eye. Nine to ten lower labials, two preoculars, one subocular, two or three postoculars. Midbody scales 19. This genus is represented by two species in Jordan, *Hemorrhoidis nummifer* and *Hemorrhoidis ravergeri*.

Hemorrhoidis nummifer (REUSS, 1834)

Coluber nummifer REUSS, 1834. – Zoologische Miscellen. Reptilien, Ophidier. Mus. Senckenbergiana, Frankfurt/M., 1:



Fig. 53. The Coin Snake, *Hemorrhhois nummifer*, from Irbid.

p. 135. – SCHÄTTI & AGASIAN, 1985, Zoologische Abhandlungen Staatliches Museum für Tierkunde. Dresden, **40**: p. 112. – DISI, AMR & DEFOSSE, 1988, The Snake, **20**: p. 45. – DISI, MODRÝ, NEČAS & REFAL, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 259.

Zamenis fedtschenkoi STRAUCH, 1873. – Mem. Acad. Imp. Sci. St. Petersburg., **7**: p. 21, **4**: p. 135, Taf. IV.

Zamenis nummifer BOULENGER, 1893. – Catalogue of the Snakes in the British Museum (Natural History), **1**: p. 407.

Zamenis glazunowi NIKOLSKY, 1896. – Ann. Acad. St. Petersburg., Append., p. 14.

Elaphe nummifera SCHMIDT, 1939. – Field Museum of Natural History, Zoology Series, **24**: p. 75.

Elaphe ravergieri SCHMIDT, 1939. – Field Museum of Natural History, Zoology Series, **24**: p. 76.

Haemorrhhois ravergieri ravergieri WELCH, 1983. – Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphisbaenia, Sauria and Serpentes, p. 69.

Hemorrhhois nummifer VENCHI & SINDACO, 2006. – Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 277.

Common name. Coin Snake.

Range. Cyprus, southeast Anatolia, Western Syria, Lebanon, Palestine, Jordan, Sinai, northern Egypt.

Distribution in Jordan. Fig. 54.

Material examined (N=45). JUMR 123, April 1978, Kufrinja. JUMR 126, March 1978, Kufrinja. JUMR 129, April 1978, Kufrinja. JUMR 249, May 1976, Ibbīn. JUMR 450, 1978, Dayr Abū Sa‘īd. JUMR 488, 1980, El Hummar. JUMR 758, October 1981, Kufrinja. JUMR 903, May 1982, As Salt. JUMR 912, June 1982, Al‘āl. JUMR 1063, September, 1982, Al‘āl. JUMR 1143, June 1982, ‘Aqrabāh. JUMR 1156, January 1983, Al‘āl. JUMR 1162, 1983, Dayr Abū Sa‘īd. JUMR 1397, May 1983, Dayr Abū Sa‘īd. JUMR 1582, May 1985, Yājūz. JUMR 1680, May 1986, Ma‘īn. JUMR 1739, March 1987, Kafr al Mā’. JUMR 1896, August 1988, Wādī al Yābis. JUMR 1897, August 1988, Al ‘Ālūk. JUMR 1926, April 1990,

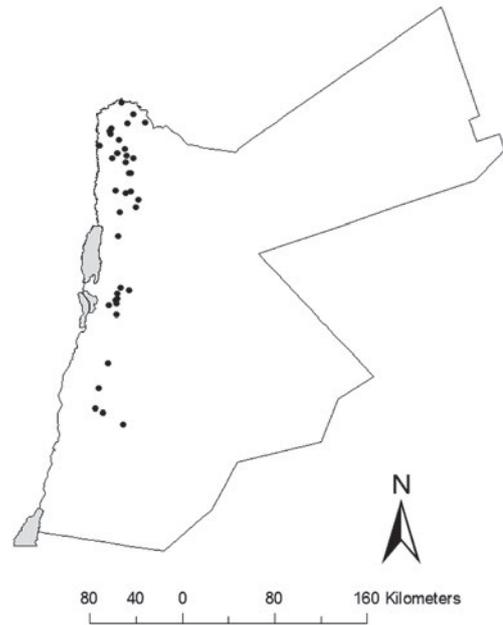


Fig. 54. Distribution of *Hemorrhhois nummifer* in Jordan.

‘Ammān. JUMR 1931, June 1990, Al ‘Adasīyah. JUMR 2096, November 1994, ‘Ammān. JUMR 2320, April 1998, Al Baq‘ah. JUMR 2403, October 1992, ‘Ammān. JUMR 2409, November 1993, Salīhī. JUMR 2444, April 1998, ‘Ammān. JUSTM 391, 5 April 1996, Kufrinja. JUSTM 066, 18 May 1992, Aqrabā. JUSTM 024, 3 December 1993, Ḥartā. MUM 060–61 & 103, 12 June 1991, Wādī Mūsā. MUM 0141, 19 August 1991, Ma‘ān. MUM 0163, 18 August 1991, Ma‘ān. MUM 0312–313, 10 June 1992, El-Shehabieh. MUM 0334, 4 June 1993, Al Hawāya. MUM 0350, 1 November 1992, Kathrabbā. MUM 0348, 7 November 1992, Al Karak. MUM 0349, 5 October 1992, El Huseiniya. MUM 0392, 1980, Al Mazār. MUM 0394, 20 September 1991, Rākīn. MUM 0396, April 1992, El Qa’. MUM 0398, April 1992, El Judaiyida. MUM 0409, 17 August 1992, Ar Rabbah.

New localities. Ajlūne Nature Reserve, Al Yadodeh, Birqish, Dānā Nature Reserve, Enbeh, Irbid, Tal‘at ar Ruzz.

Published records. Al Karak (BARBOUR, 1914), Ajlūn, Al Jubayhah, Al‘āl, Al Karak, ‘Ammān, Aqrabā, Ar Ramthā, As Salt, Basta, Dayr Abū Sa‘īd, Ibbīn, Irbid, Kufrinja, Jarash, Jinnīn aṣ Ṣafā, Sūf (DISI *et al.*, 1988), Wādī Mūsā (AMR *et al.*, 1994), Al Hawāya, Al Karak, Al Mazār, Al Qa’, Ar Rabbah, El Huseiniya, El Quweirah, El Judaiyida, El Shehabieh, Kathrabbā, Rākīn, Ma‘ān (EL ORAN *et al.*, 1994), Miḥnā (SINDACO *et al.*, 1995), Dibbīn (DAMHOUREYEH *et al.*, 2009).

Materials recorded in other museums. MCC/R612, Miḥna (= Miḥnā) surroundings, 27 April 1994, *leg.* R. SINDACO & N. FEDRIGHINI. SMF 76170, ‘Ammān, 15 December 1965, *leg.* J. KLAPPERICH. ZFMK 44373, Dayr Abū Sa‘īd (listed as *Hemorrhhois ravergieri*). ZFMK 44374, Kufrinja (listed as *Hemorrhhois ravergieri*).

Systematics. SCHÄTTI & AGASIAN (1985) analyzed all characters used by previous herpetologists in determining the specific status of the *ravergieri-nummifer* complex. They concluded that both species are

Table 11. Scale counts and measurements (mm) for *Hemorrhhois nummifer* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0042	♂	212	90	916	260
MUM0060	♂	211	83	734	197
MUM0141	♀	202	92	885	259
MUM0312	♂	225	90	900	300
MUM0313	♀	205	91	960	270
MUM0348	♀	203	92	235	71
MUM0350	♂	220	95	295	69
MUM0392	♂	208	92	650	210
MUM0393	♀	205	85	700	205
MUM0409	♀	203	92	690	239

morphologically and ecologically separate. In their study they presented two pholidotic characters, number of midbody and subcaudal scales. SCHÄTTI & UTIGER (2001) and SCHÄTTI *et al.* (2001) recognized the genera *Hemorrhhois*, *Hierophis* and *Platyceps* for the species previously assigned to *Coluber* and allocated *nummifer* under *Hemorrhhois*.

Diagnosis. Large stout snake. Head is flat and distinct from neck. Eyes with rounded pupils. Eight to nine UL, 5th and 6th entering the eye. Nine to ten LL, two PO, one subocular, two or three PtO. MBS 23–25, VS 195–228, CS 79–95. Anal divided. Maximum total length may reach 100 cm. Table 11 includes scale counts and body measurements for *Hemorrhhois nummifer*.

Colouration. The dorsal side is usually grey, brown or yellow, covered by a median row of dark brown circular or oval spots with black edges (Fig. 53). Head with inverted V-shaped markings and a crossbar between the eyes.

Habitats and ecology. It is usually found in shrubby and forested areas that extend along the mountainous range stretching from the north as far as Petra to the south. It is found sympatrically with the *Daboia palaestinae*, as well as with the two large colubrids; *D. jugularis* and *Malpolon insignitus*.

Biology. It feeds on chameleons and the House Sparrow, *Passer domesticus*, as well as on the Broad-toothed Field Mouse, *Apodemus mystacinus* (AMR & DISI, 1998). This feeding habit may suggest the climbing ability of this snake. Adults are usually diurnal and can be observed basking. Females lay 4–10 eggs (DISI *et al.*, 2001). Head triangulation, size and defensive behavior are similar to the sympatric Palestine Viper, *D. palaestinae* (WERNER & FRANKENBERG, 1982). *Hemorrhhois nummifer* is an aggressive

snake. It imitates the Palestine Viper in its posture as well as body colouration pattern. A specimen was kept in captivity for over 8 years and fed on laboratory mice.

Remarks. Specimens with higher scale counts are from Iraq and the southern states of the former Soviet Union. Specimens from the south western part of the Caspian Sea have 17 mid-body scales, while in the eastern populations have 15 mid-body scales (DISI, 2002). Maximum length of adult specimens may reach 200 cm long.

Hemorrhhois ravergieri (MÉNÉTRIÉS, 1832)

Coluber ravergieri MÉNÉTRIÉS, 1832. – Cat. Rais, Obj. Zool. Voy. Caucase, p. 69. – SCHÄTTI & AGASIAN, 1985, Zoologische Abhandlungen Staatliches Museum für Tierkunde. Dresden, **40**: p. 110. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 261.

Zamenis ravergieri BOULENGER, 1893. – Catalogue of the snakes in the British Museum (Natural History), **1**: p. 405. *Hemorrhhois ravergieri* VENCHI & SINDACO, 2006. – Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 278.

Common name. Ravergier's Whip Snake.

Range. China through the southern states of the former Soviet Union, Afghanistan, Iran, Turkey, Iraq, Syria and Jordan.

Distribution in Jordan. Fig. 56.

Material examined (N=5). *JUMR 670*, June 1981, Dayr Al Kahf. *JUMR 672*, June 1981, Dayr Al Kahf. *JUMR 932–933*, July 1982, Dayr Al Kahf. *JUSTM 420*, 26 November 2002, El Aritein.

New localities. Safawi, Umm al Qitayn.

Published records. Dayr Al Kahf (DISI, 1993).



Fig. 55. Ravergier's Whip Snake, *Hemorrhais ravergieri*, from El Aritein.

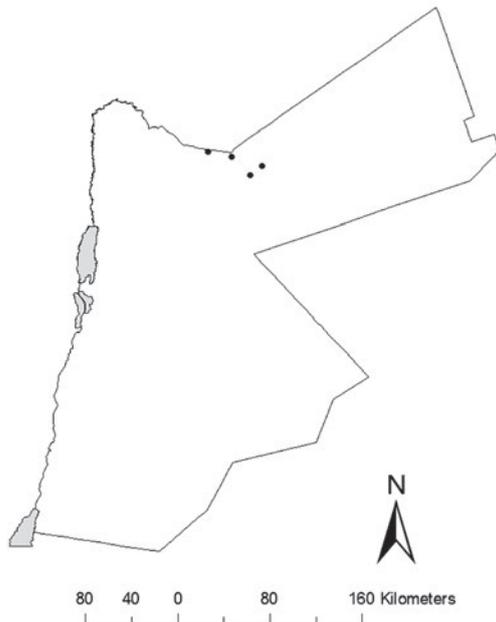


Fig. 56. Distribution of *Hemorrhais ravergieri* in Jordan.

Systematics. FLOWER (1933) considered *H. nummifer* as a race of *H. ravergieri* and listed “*nummifer*” as a synonym of “*ravergieri*”. Other authors considered these separate species (e.g. WERNER & AVITAL 1980). SCHÄTTI & AGASIAN (1985) presented evidence, morphological and ecological, that *H. ravergieri* and *H. nummifer* are two distinct species, and indicated some areas of sympatry in Anatolia to Middle Asia. Molecular data suggest that this taxon is paraphyletic, with close a relationship to *H. nummifer* (SCHÄTTI & UTIGER, 2001).

Diagnosis. Head is wide and distinct from neck. 9/9 UL, 5th and 6th entering the eye. MBS 21–23, VS 189–199, CS 73–108 (74–99 in males, 70–94 in fe-

males). All subcaudal scales are paired. Dorsal spots usually joined to form a zig-zag pattern, but they are never roundish (Fig. 55). Maximum total length may reach 100 cm.

Colouration. Head with distinct markings. A dark oblique streak below the eye, one streak extends from the eye to the end of the mouth. Body is uniformly brown, covered with rectangular crossbars that are interspaced by white markings. Dorsal crossbar alternates with two rows of spots on both sides. Mid-dorsal bars and the lateral spots are in confluent forming three dense longitudinal lines on the tail. Ventral side is gray, flecked with dark spots.

Habitats and ecology. The Ravergier's Whip Snake inhabits high altitudes (more than 1200 m). Its presence in Dayr Al Kahf, an isolated elevation in the eastern desert of Jordan, suggests its relictary distribution in Jordan. WERNER & AVITAL (1980) reported similar findings in Mount Hermon, Syria.

Biology. AMR & DISI (1998) recovered a chameleon and a house mouse from stomachs of two Ravergier's Whip Snake. It usually feeds on lizards, small mammals, newly hatched chicks and annelids (BÖHME, 1993). Females are oviparous, laying 3–10 eggs (LATIFI, 1991; BÖHME, 1993). It starts its activity after hibernation when temperature reaches 17 °C (DISI, 2002).

Remarks. DISI (1993) examined 22 specimens collected from Jordan, Armenia, Turkey, Iran, Transcaspien, and Iraq. He found that the Jordanian specimens have the lowest scale counts.

Genus *Lytorhynchus* PETERS, 1863

Species of this genus are characterized by their projecting flat snout and large rostrum. Their eyes have elliptical pupils. The nostril forms an oblique slit between two large nasals. Six species belonging to this genus have been described, with a distribution ranging from North Africa and the Sahara in the West, through southern Turkey and the former Soviet Union to Pakistan and Afghanistan to the East (GASPERETTI, 1988).

General features of this genus include: Maxillary teeth six to nine, posterior much longer than anterior; mandibular teeth subequal. Head slightly distinct from neck, with cuneiform projecting snout; eye moderate, pupil vertically elliptic; rostral large, four-sided, projecting, concave inferiorly; nostril is



Fig. 57. The Diademed Sand Snake, *Lytorhynchus diadema* from Mudawarah (D. Modrý).



Fig. 59. The *kennedyi* form of *Lytorhynchus diadema* from Al Jafr (D. Modrý).

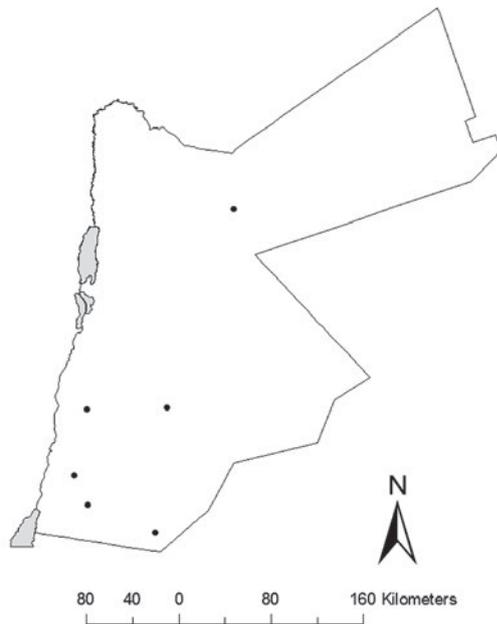


Fig. 58. Distribution of *Lytorhynchus diadema* in Jordan.

an oblique slit between two nasals. Body elongate, cylindrical; scales smooth or feebly keeled, without apical pits, in 19 rows; ventrals obtusely angulated laterally. Tail moderate or short; subcaudals in two rows.

***Lytorhynchus diadema* (DUMÉRIL, BIBRON & DUMÉRIL, 1854)**

Heterodon diadema DUMÉRIL, BIBRON & DUMÉRIL, 1854. – Erp. Gén., **7**: p. 779.

Lytorhynchus diadema PETERS, 1862. – Monatsber. Akad. Wiss. Berlin, **1861**: p. 272. – BOULENGER, 1893, Catalogue of the Snakes in the British Museum (Natural History), **1**: p. 415. – DISI, AMR & DEFOSSÉ, 1988, The Snake, **20**: p. 47. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 131. – SCHLEICH, KÄSTLE & KABISCH, 1996, Amphibians and Reptiles of North Africa, p. 494. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians

and Reptiles of the Hashemite Kingdom of Jordan, p. 265. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 280.

Lytorhynchus gaddi NIKOLSKY, 1907. – Annuaire du Musée Zoologique de l’Académie des Sciences de St. Petersburg, **10** [1905]: p. 294.

Lytorhynchus diadema kennedyi SCHMIDT, 1939. – Field Museum of Natural History, Zoology Series, **24**: p. 75. – LEVITON, ANDERSON, ADLER & MINTON, 1992, Handbook to the Middle East Amphibians and Reptiles, p. 98.

Common name. Awl-headed Snake, Diademed Sand Snake, Crowned Leafed-nosed Snake.

Range. Across North Africa, through Sinai and the neighboring countries to western Iran.

Distribution in Jordan. Fig. 58.

Published records. Al Jafr (AL-ORAN, 2000), Azraq (DISI, 1985; GASPERETTI, 1988), Petra (DISI, 1985), Wādī Ramm (ABU BAKER *et al.*, 2004),

New localities. Al Mudawwarah, El Quweira, Wādī Ramm.

Materials recorded in other museum. CAS 147594, before December 1977, Azraq, *leg.* F.A. WAZANI.

Systematics. LEVITON *et al.* (1992) recommended treating *L. kennedyi* and *L. gaddi* as subspecies of *Lytorhynchus diadema* to harmonize the application of the species concept within the *L. diadema* group. However, SCHÄTTI & GASPERETTI (1994) rejected the placement of *L. gaddi* as a subspecies of the *diadema* complex for the unjustified conclusions given by LEVITON *et al.* (1992).

Diagnosis. Snout moderately long; rostral angularly bent, with straight horizontal edge, detached on the sides, the portion visible from above as long as its distance from the frontal; no lateral cleft in the rostral. Suture between the internasals much shorter than that between the prefrontals. Frontal nearly as long as its distance from the end of the snout, slightly shorter than the parietals. A small, squarish loreal. One or two PO, with or without a subocular below; two PtO.

Temporals 1+2 or 2+3; seven or eight UL, 4th, 5th, or 4th and 5th, entering the eye. Three LL in contact with the anterior chin-shields; posterior chin-shields as long as or a little longer than the anterior, and separated from each other by two series of scales. Scales smooth in 19 rows, VS 152–195; CS 30–49. Anal divided. Maximum length may reach 45 cm.

Colouration. Pale buff or cream colour above, with a series of 13–18 large transversely rhomboidal dark spots; a dark median band along the head and nape, sometimes confluent with an interocular transverse band; an oblique dark band from the eye to the angle of the mouth; lower parts uniform white (Fig. 57). The “*kennedyi*” form is bright orange to reddish (Fig. 59), with dark transverse on the body and the tail (AL-ORAN, 2000).

Habitats and ecology. The Diademed Sand Snake is a nocturnal species. It inhabits sand deserts, gravel plains and “*sabkhal*”. The modified rostral scale of this snake is an adaptation for its burrowing behavior in sandy habitats. Its distribution in Jordan is mainly confined to sand dunes, which are found in isolated deserts, but it was also reported from areas of gravel plains interrupted by undulating sand and low hills (BAHA EL DIN, 1996). Movement of this snake is in serpentine manner, leaving very distinctive tracks.

Biology. It feeds most frequently on animals inhabiting burrows or holes (BAHA EL DIN, 1996). It seems to prefer nocturnal lizards, particularly geckos (EGAN, 2007).

Remarks. MORAVEC (1998) stated that the “*kennedyi*” form of *L. diadema* is rare and is considered of no systematic value.

Genus *Malpolon* FITZINGER, 1826

This genus includes back-fanged species, with one or two large grooved fangs, situated approximately below the posterior border of the eye. *Malpolon monspessulanus* is represented by two species: *Malpolon monspessulanus* distributed in the Iberian Peninsula and southern France, and *Malpolon insignitus* found in southern Europe, Turkey to Iran, and westwards to North Africa (WOERKOM, 1982; CARRANZA *et al.*, 2006).



Fig. 60. Adult Montpellier Snake, *Malpolon insignitus*, from Melka.

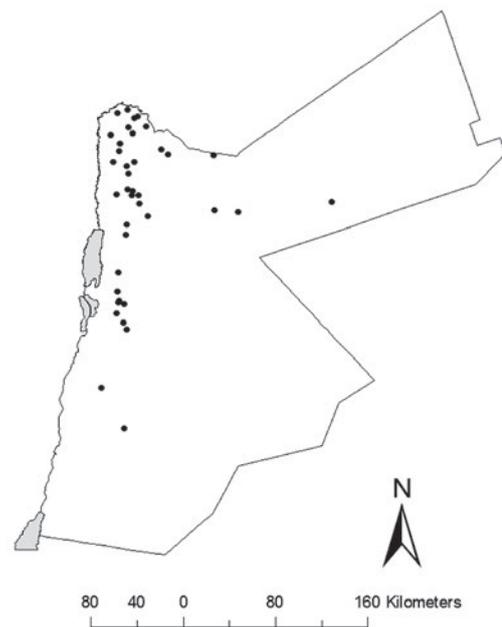


Fig. 61. Distribution of *Malpolon insignitus* in Jordan.

Malpolon insignitus (GEOFFROY DE ST-HILAIRE, 1809)

Coluber insignitus GEOFFROY DE ST-HILAIRE, 1809. – Desc. Egypt, Hist. Nat., **1**: p. 15.

Coelopeltis monspessulana BOULENGER, 1896. – Catalogue of the Snakes in the British Museum (Natural History), **3**: p. 141.

Malpolon monspessulana insignitus MERTENS & MÜLLER, 1928. – Abh. Senck. Ges., **41**: p. 51.

Malpolon monspessulanus DISI, AMR & DEFOSSE, 1988. – The Snake, **20**: p. 46. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 153. – KHALAF, 1959, Reptiles of Iraq with Notes on the Amphibians, p. 72. – SCHLEICH, KÄSTLE & KABISCH, 1996, Amphibians and Reptiles of North Africa, p. 502. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 295. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 282.



Fig. 62. Juvenile Montpellier Snake, *Malpolon insignitus*, from Birqish.

Malpolon insignitus CARRANZA, ARNOLD & PLEGUEZUELOS, 2006. – Molecular Phylogenetics and Evolution, **40**: p. 533.

Common name. Montpellier Snake.

Range. Balkan, Greek Islands, Turkey, Caucasia extending to the Caspian Sea, Turkey, Syria, Lebanon, Palestine, Jordan, eastern North Africa.

Distribution in Jordan. Fig. 61.

Material examined (N=70). JUMR 113, April 1978, Şakrah. JUMR 156, 22 May 1978, Al Jubayhah. JUMR 270–271, May 1979, Al Jubayhah. JUMR 468, May 1980, Rujm ash Shid. JUMR 486, 14 August 1980, Al Jubayhah. JUMR 449, 1978, Dayr Abū Sa'īd. JUMR 469, May 1980, As Salt. JUMR 471, no date, Al Jubayhah. JUMR 486, 1980, Al Jubayhah. JUMR 493, June 1980, Al Jubayhah. JUMR 499, May 1980. JUMR 667, 18 May 1981, Yājūz. JUMR 670, 6 June 1981, Jāwā. JUMR 675, June 1981, Dayr al Kahf. JUMR 680, 18 December 1978, Kufrija. JUMR 683, 12 May 1981, Ayl. JUMR 821, 10 December 1981, Ar Ramthā. JUMR 824, 10 December 1981, Ar Ramthā. JUMR 826, 23 November 1982, Al Jubayhah. JUMR 864, April 1982, Abū Nuşayr. JUMR 876, May 1982, 'Ammān. JUMR 902, 21 May 1982, Al'al. JUMR 904, 2 May 1982, Jāwā. JUMR 916, 12 June 1982, Al'al. JUMR 922, 21 June 1982, Khaldyeh. JUMR 937, 19 May 1981, Umm al Qiṭṭayn. JUMR 1146, October 1982, Ḥartā. JUMR 1169, 1982, Dayr Abū Sa'īd. JUMR 1186, 1982, Dayr Abū Sa'īd. JUMR 1257, September 1982, Ar Ramthā. JUMR 1292, May 1983, Dayr Abū Sa'īd. JUMR 1341, May 1983, Ḥisbān. JUMR 1361, June 1983, Ma'an. JUMR 1373, July 1984, Um Al Hiran. JUMR 1379, 1982, 'Ammān. JUMR 1380, 11 April 1983, Um Al Ḍānānair. JUMR 1384, 1983, Al Jubayhah. JUMR 1413, June 1983, Azraq. JUMR 1414, June 1983, Al'al. JUMR 1442, July 1983, Um Al Hiran. JUMR 1700, April 1986, Ash Shūnah ash Shamāliyah. JUMR 1702, April 1986, Qaṣr al Ḥallābāt. JUMR 1828, 29 August 1987, Al Qunayṭirah. JUMR 1875, 5 May 1987, Wādī ad Dulayl. JUMR 1876, April 1988, Mādabā. JUMR 1893, 2 July 1988, Yājūz. JUMR 1906–1907, April 1989, Yājūz. JUMR 1911, June 1989, Yājūz. JUMR 1931, June 1990, Na'ūr. JUMR 2560, May 1998, Irbid. JUMR 2577, 1984, Azraq. JUMR 2578, 28.4.1990, Yājūz. JNHM 101, 2 February 1981, Ar Ramthā. JNHM 565, 24 April 1983, Irbid. JNHM 729, June 1984, Ir-

bid. JNHM 1141, no date, Irbid. JUSTM 237, 12 June 1994, Tabarbaur. JUSTM 307, 4 September 1995, Sariḥ. JUSTM 406, May 2000, Kafr Khal. MUM 0014, 18 August 1991, Ma'an. MUM 0074, 1991, Ash Shawbak. MUM 0165, 9 September 1991, Mu'tah. MUM 0333, 28 May 1993, Zahum. MUM 0335, 30 June 1993, Mu'tah. MUM 0401, 19 July 1992, El 'Aina. MUM 0420, July 1992, Batīr. MUM 0421, 1992, Al Karak. MUM 0424, 2 May 1993, Al Waseyah.

New localities. Ajlūne Nature Reserve, Al Kamāliyah, Al Mafraq, Al Shajarah, As Salt, Birqish, Enbah, Melka, Şurra.

Published records. Al Mafraq (SCHMIDT, 1939), Azraq (WERNER, 1971), Ayl, Al'al, Al Jubayhah, Shawmarī, Azraq, Dayr Abū Sa'īd, Ar Ramthā, Ḥisbān, Irbid, Jāwā, Khaldyeh, Kufrija, Ma'an, Umm al Qiṭṭayn (DISI *et al.*, 1988), Al Karak, Al Waseyah, Ash Shawbak, Batīr, El 'Aina, Ma'an, Mu'tah, Zahum (EL ORAN *et al.*, 1994), Jarash (SINDACO *et al.*, 1995), Al Wisād, Shawmarī, between Qaṣr 'Amra and Azraq (DISI *et al.*, 1999), Ma'an (AMR *et al.*, 1994), Al Badhiyeh, King Talla Dam, Zūbiyā (DISI *et al.*, 2001), Dibbīn (DAMHOUREYEH *et al.*, 2009).

Materials recorded in other museum. BM 1965.807, 1965, Azraq, leg. D. WESTERN. FMNH 19578, no date, Al Mafraq, leg. H. FIELD & R. A. MARTIN.

Systematics. CARRANZA *et al.* (2006) found that the western and eastern units of *M. monspessulanus* have different dorsal colour pattern, differences in skull structure and exhibit an 8.4% uncorrected genetic divergence. They recommended that these populations should be treated as separate species (*M. monspessulanus (sensu stricto)* and *Malpolon insignitus* stat. nov.) for the populations in the Middle East.

Diagnosis. This is a robust and large snake. Head is slightly distinct from the neck, with a deep distinctive furrow. Nasal undivided. Eyes large with a rounded pupil. Eight to nine UL, 5th and 6th in contact with eye. Two loreals, one pre- and two to three postocular. Temporals 1 + 1 or 1 + 2. Seven LL, 3rd and 4th entering the eye. Three or four lower labials in contact with the anterior chin shields; posterior chin shields very small. 19 MBS, 159–195 VS and 89–97 CS. Maximum total length may reach up to 200 cm. Tables 12 and 13 show scale counts and body measurements for *Malpolon insignitus*.

Colouration. Ventral is usually grey to brown in colour in adults, sometimes olive-greenish grey (Fig. 60). Juveniles have small dark spots with weak white longitudinal lines (Fig. 62).

Habitats and ecology. The Montpellier Snake inhabits the Mediterranean biotope in Jordan. It is usually associated with vegetated areas. However, it was collected from Azraq oasis (laying in the Irano-Turanian biotope). Evidently its presence in Azraq, Al Wisād and Shawmarī is relictray, after the formation of arid land mass around Azraq.

Table 12. Scale counts and measurements (mm) for *Malpolon insignitus* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0165	♀	173	92	260	77
MUM0333	♀	172	88	425	130
MUM0335	♀	167	86	420	140
MUM0420	♀	172	90	590	270

Table 13. Scale counts and measurements (mm) for *Malpolon insignitus* specimens at Jordan University Museum.

Specimen No.	Sex	UL	LL	PO	PtO	MBS	VS	CS	SV	T
JUMR451	nd	8/8	10/10	1/1	2/2	19	164	85	245	75
JUMR468	nd	8/8	10/?	1/1	2/2	19	163	85	925	163
JUMR470	♀	8/8	11/11	1/1	2/2	19	172	83	925	275
JUMR499	♀	8/?	10/11	nd	nd	19	166	88	765	304
JUMR680	♀	8/8	10/11	1/2	2/?	19	172	83	1165	205
JUMR824	♀	8/8	10/10	1/1	2/2	19	178	96	255	75
JUMR826	nd	8/8	10/10	1/1	2/2	19	171	91	785	270
JUMR864	Juv.	8/?	nd	1/1	2/2	19	173	86	315	90
JUMR902	♀	8/8	11/11	1/1	2/2	19	173	91	665	250
JUMR955	♂	8/8	nd	1/1	2/2	19	nd	83	955	275
JUMR973	♂	8/8	10/11	1/1	2/2	19	179	84	1180	330
JUMR916	nd	8/8	11/11	1/1	2/2	19	173	nd	1080	nd

Biology. The Montpellier Snake is mainly herpetophagous, it feeds on the young of *Dolichophis jugularis*, the Pale Agama, *Trapelus pallidus*, the Starred Agama, *Laudakia stellio*, the Common Chamaeleon, *Chamaeleo chamaeleon* and the Golden Skink, *Eumeces schneideri* (AMR & DISI, 1998). This a diurnal snake observed during late afternoon basking on stones or moving among vegetation. Females are oviparous, lay up to 20 eggs (LATIFI, 1991). In captivity, when provoked it hisses very loudly for a relatively long time, and attempts to bite.

Remarks. The distribution of Montpellier Snake in Jordan represents its southernmost range of distribution in the Middle East. Highest densities are known from Mediterranean regions of the country, and other localities in arid regions have been reported.

Genus *Natrix* LAURENTI, 1768

This genus includes more than 70 species distributed across North America, Europe, Africa and Asia. Species of this genus are associated with freshwater habitats. Head is distinct from neck and covered by large symmetrical shields. Eyes are large with rounded pupils. Dorsal scales are distinctly keeled with apical

pits. This genus is represented by a single species in Jordan, *Natrix tessellata*.

Natrix tessellata (LAURENTI, 1768)

Coronella tessellata LAURENTI, 1768. – Syn. Rept., p. 87.

Tropidonotus tessellatus BOULENGER, 1893. – Catalogue of the Snakes in the British Museum (Natural History), **1**: p. 233.

Natrix tessellata tessellata DISI, AMR & DEFOSSE, 1988. – The Snake, **20**: p. 47.

Natrix tessellata DISI, MODRÝ, NEČAS & REFAI, 2001. – Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 297. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale "G. Doria", Genova, **98**: p. 284.

Common name. Dice Snake, Diced Water-snake.

Range. Central and southeastern Europe extending to China eastwards, the Near East and the Nile Delta in Egypt (LEVITON *et al.*, 1992).

Distribution in Jordan. Fig. 64.

Material examined (N=43). JUMR 128, March 1978, Kufrinja. JUMR 325, 12 December 1978, Sukhna. JUMR 489, June 1980, Fuheis. JUMR 550, 1978, Sukhna. JUMR 551, April 1979, Dayr 'Allā. JUMR 557, April 1979, Dayr 'Allā. JUMR 664, May 1981, az Zarqā'River. JUMR 709, October 1981, Wādī Sha'eb. JUMR 842–844, November 1981, Wādī Sha'eb. JUMR 859–861, April 1982, King Talal Dam. JUMR 869 & 901, May 1982, Al'al. JUMR 941, July 1982,



Fig. 63. The Dice Snake, *Natrix tessellata*, from az Zarqā' River.

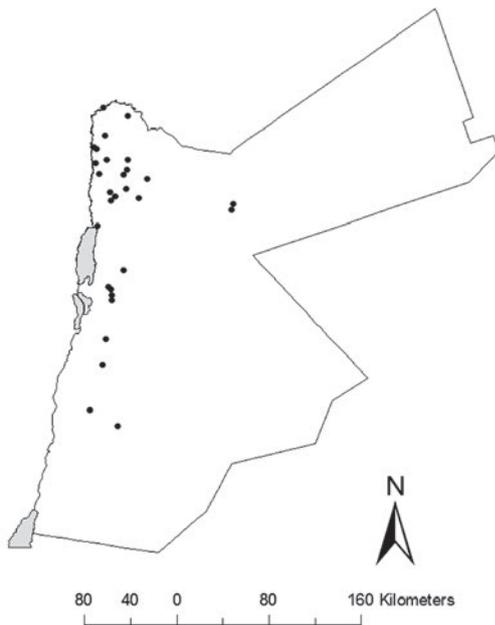


Fig. 64. Distribution of *Natrix tessellata* in Jordan.

Al'al. JUMR 1135–1136, October 1982, Wādī Sha'eb. JUMR 1154, January 1983, Fuḥeis. JUMR 1367, no date, 'Ayn Ghazāl. JUMR 1683, October 1986, Wādī al Yābis. JUMR 1707, no date, El Karāma. JUMR 1729, March 1987, Kafr al Ma'. JUMR 1921–1922 & 1924, 1989, Kuraymah. JUMR 2088, May 1995, As Salt. JUMR 2104, 1992, Wādī Al Mujib. JUMR 2146, May 1995, As Salt (Jala'd). JUMR 2160–2162, July 1995, Fuḥeis (sail Al Azraq). JUMR 2205, April 1996, Salihī. JUMR 2296, July 1995, Fuḥeis (sail Al Azraq). JUMR 2474, June 1997, Abū Nuṣayr. JUMR 2520, April 1998, Salihī. JUSTM 416, 6 May 2001, Wādī Kufrinja. MUM 0138–139, 18 August 1991, Ma'an. MUM 0339, 12 June 1992, Wādī Ibn Hammad. MUM 0372, 26 May 1992, Al Karak. MUM 0403, 15 May 1991, Rākīn.

New localities. Al Hamma, Al Swuymeh, az Zarqā', Sukhna, Jordan River, Kuraymah, Wādī Al Mujib.

Published records. Azraq (NELSON 1972), Al Birkatayn (Jarash), Azraq ash Shīshān (WERNER, 1972), Azraq, az Zarqā'-River, East Ghawr Canal (DISI *et al.*, 1988), Ayl, Ma'an, Wādī

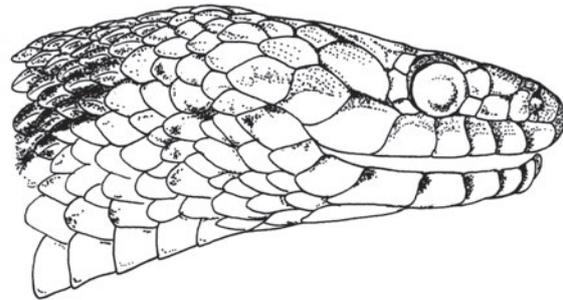
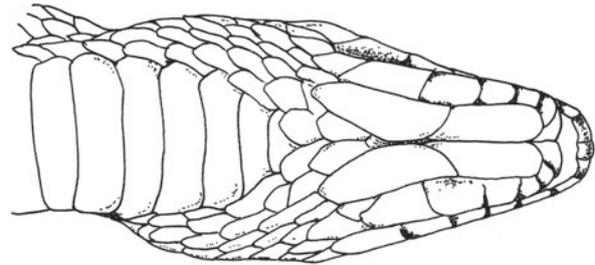
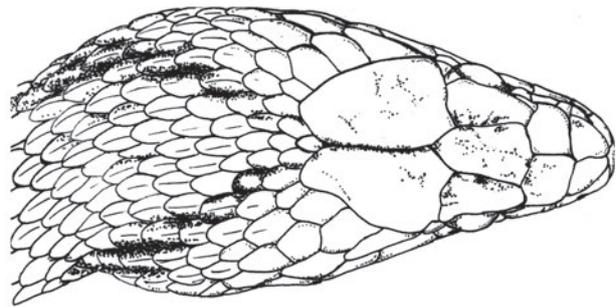


Fig.65. Lateral, dorsal and ventral views of the head of *Natrix tessellata* from az Zarqā' River.

Mūsá (AMR *et al.*, 1994), Al Karak, Ma'an, Rākīn, Wādī bin Hammad, (EL ORAN *et al.*, 1994), Azraq Wetland Reserve (DISI *et al.*, 1999), Ḍānā (DISI *et al.*, 2001).

Materials recorded in other museums. CAS 147589, before December 1977, Azraq, *leg.* F.A. WAZANI. BM 1965.696, 1965, Azraq ash Shīshān, *leg.* S. BISSERÔT. MCZ R-9687, January 1914–31 December 1914, Wādī al Ḥasā (E Dead Sea), *leg.* J. C. PHILLIPS & W. M. MANN. HUIJ-R3024, 3063, 3071, November 1945, *leg.* G. HAAS & J. H. HOOFIEN. HUIJ-R 21403, Transjordan, 1946.

Systematics. MALNATE (1960) gave a review on the systematics and evolution of the genus *Natrix*. This genus should be considered more carefully in terms of species found in the Old and the New World. From an evolutionary point of view, GUICKING *et al.* (2006) pointed out that the Jordanian population of *N. tessellata* is closest to those in Egypt, among the samples examined.

Diagnosis. *N. tessellata* is slender and long, reaching a maximum of 105 cm. Head is narrow with medium-sized eyes with a rounded pupils. Rostrum broader than deep. Two PO, three PtO. Eight UL (rarely

Table 14. Scale counts and measurements for *N. tessellata* specimens at the Jordan University Museum.

Spec. No.	Sex	UL	LL	Pro	Pot	MDS	VS	CS	SV	TL
JUMR349	nd	8/8	10/9	2/2	3/3	19	180	68	200	50
JUMR357a	P	8/8	10/10	2/2	3/3	19	167	64	445	114
JUMR357b	P	8/8	10/10	2/2	3/3	19	167	59	485	123
JUMR372	nd	8/8	10/10	2/3	3/3	19	167	59	818	185
JUMR437	♂	8/8	10/10	2/2	3/3	19	158	55	480	112
JUMR438	♂	8/8	10/10	2/2	3/3	19	160	54	655	147
JUMR440	♂	8/7	10/10	2/2	3/3	19	167	61	497	117
JUMR454	♂	8/8	10/10	2/2	3/3	19	161	58	685	155
JUMR550	nd	8/8	9/10	2/2	3/3	19	162	UD	610	UD
JUMR558	♂	8/8	10/10	2/2	3/3	19	168	63	220	55
JUMR613	♂	8/8	10/10	2/2	3/3	19	165	55	443	88
JUMR709	♂	8/8	10/10	2/2	3/3	19	168	50	290	70
JUMR842	♂	8/8	10/10	2/2	3/3	19	164	56	860	173
JUMR849	♂	8/8	10/10	2/2	3/3	19	168	58	520	125
JUMR1163	♂	8/8	10/10	2/3	4/4	19	164	57	650	150
JUMR1358	♂	8/8	10/10	2/2	3/3	19	167	58	665	145
JUMR1675	nd	8/8	10/10	2/2	3/3	19	168	57	820	157

Table 15. Scale counts and measurements (mm) for *Natrix tessellata* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0138	♂	157	59	415	114
MUM0139	♀	149	67	217	63
MUM0339	♂	163	64	270	78
MUM0372	♀	167	69	650	195
MUM0403	♂	166	60	250	62

seven), the 4th and the 5th enter the eye (Fig. 63). LL consist of 9–10 scales. MBS consists of 19 strongly keeled (Fig. 65), VS 158–189, CS 50–68. Anal scale divided. Tables 14 and 15 show scale counts and body measurements for *N. tessellata*.

Colouration. Colour pattern varies from light green to olive to dark gray with four prominent rows of squarish dark brown or black spots on the dorsum. Ventral side may be white, yellow, pink, red or black, with medial longitudinal black stripes or blotches. Ventral side of the tail is usually black (DISI *et al.*, 2001). A specimen collected from az Zarqā'River showed a uniform olive-green colour, without the alternating pattern.

Habitats and ecology. *Natrix tessellata* is a fresh water-associated snake that lives in close proximity to permanent water bodies. Despite the aridity of Jordan, the Dice Snake inhabits most of the water courses along the Jordan and Yarmouk rivers and their tributaries. In the mountain ranges, it occurs along small streams and pools or ponds. *Natrix tessellata* takes

refuge among the vegetation nearby the water bodies, usually under thick bushes of *Typha domingensis* or *Phragmites australis* and coils itself in muddy areas. Typical food of the Dice Snake includes several species of amphibians and reptiles as well as small freshwater fishes. In Birket al Ara'is, it coexists with a number of amphibians including the Levantine frog, *Rana bedriagae*, the Green Toad, *Bufo viridis* and the Tree Frog, *Hyla savignyi*, reptiles (the Striped-Necked Terrapin, *Mauremys rivulata*), and the cyprinid fish, *Garra rufa*. Also, the Levantine Crab, *Potamon potamios*, is common. Other terrestrial reptiles such as the Starred Agama, *Laudakia stellio*, the European Chameleon, *Chamaeleo chamaeleon*, the Bridled Skink, *Mabuya vittata* and the Mediterranean Spur-thighed Tortoise, *Testudo graeca* live within the proximity of the pond (RIFAI & AMR, 2004). In the Azraq Nature Reserve pools, it was associated with four species of fishes (*Oreochromis aureus*, *Acanthobrama lissneri*, *Aphanius sirhani* and *Tilapia zilli*), two amphibians (*P. viridis* and *Pelophylax bedriagae*). Lush and dense vegetation of *Arundo donax*, *Phragmites* sp. and *Typha* sp. surrounds the open water

pools and water depth varies on a seasonal basis and reaches a minimum of 40 cm (AMR *et al.*, 2011).

Biology. AMR & DISI (1998) reported on the batrachophagous diet of this snake, where it feeds mainly on the Green Toad, *P. viridis*. During the day time, it frequent water for feeding or sunbathes among rocks close to water. Sunbathing was observed on several occasions, where snakes select a substrate either in the water body itself (e.g. stones, tree trunk etc) or along its margins. They coil up themselves and enjoy the sun for several hours. At the King Talal Dam, the Dice Snake was seen sunbathing on rocks, mud piles and decayed plant materials.

Mating was observed during May, and eggs were found among decaying plants on ground close to the water course. PERRY & DMI'EL (1988) reported an average of 12.3 ± 4.58 eggs per clutch for captive breed *N. tessellata*. The mating takes place near water. Aggregation behavior for the purpose of mating of *N. tessellata* was observed in South Azraq pools in May, 2003. More than 50 snakes were aggregated together over water and extending their bodies over branches of *Typha*. Each male was extending along the dorsum of a female with the head pressed over. Males crawled to the backs of the females, and took exactly the same body curvature as the females. No mating balls were observed.

Feigning death or thanatosis was observed among *N. tessellata* in Jordan. One specimen in Azraq played dead while an attempt was made to pick it up, it coiled itself, with its mouth opened and the tongue protruded outside and blood running from the mouth. This behavior was also described by DISI *et al.* (2001).

Remarks. In Jordan, this species is found along the Mediterranean freshwater habitats extending from northern Jordan reaching as far as Petra in the south. The highest population inhabits the az Zarqā' River system that extends from the east of az Zarqā' across Jarash and west to the Jordan Valley. No other localities have been recorded after Wādī al Mujib around the Dead Sea basin, despite the presence of some streams draining into the Dead Sea. Also, none of the permanent streams of Wādī 'Araba hold any populations of *N. tessellata*. Ma'ān, represents the extreme southern range in Jordan, where the only spring, Al Ghadeer, in the old town of Ma'ān used to harbour a viable population of the Dice Snake.



Fig. 66. The Red Whip Snake, *Platyceps collaris*, from Ajlūne Nature Reserve.

Genus *Platyceps* BLYTH, 1860

This genus includes the racers, which are thin-bodied snakes. They are usually long and cylindrical with long smooth tails. The neck is hardly distinct from head. Eyes are small with rounded pupils. Body scales are smooth, with 19 mid-body scales. For revisions of the genus see comments under „systematics“ for each species. In Jordan, this genus include five species: *Platyceps collaris*, *Platyceps elegantissimus*, *Platyceps rhodorachis*, *Platyceps rogersi* and *Platyceps sinai*.

Platyceps collaris (MÜLLER, 1878)

Zamenis dahlia rubriceps VENZMER, 1919. – Arch. Naturgesch. Berlin, **83**: 95–122.

Coluber najadum DISI, AMR & DEFOSSE, 1988. – The Snake, **20**. p. 44.

Coluber rubriceps GRUBER, 1989. – Die Schlangen Europas und rund ums Mittelmeer, p. 90. – EL-ORAN, AL-MELHEM & AMR, 1994, Bollettino di Zoologia, 61: p. 360. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 271.

Platyceps collaris VENCHI & SINDACO, 2006. – Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 284

Common name. Red Whip Snake.

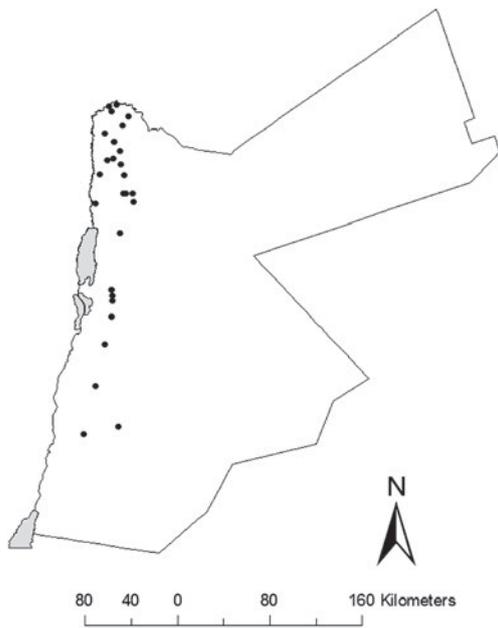
Range. Black Sea coast of Bulgaria, Aegean coast, Syria, Lebanon, Palestine and Jordan.

Distribution in Jordan. Fig. 67.

Material examined (N=37). JUMR 130, 9 April 1976, Kufrinja. JUMR 131, 9 April 1978, Kufrinja. JUMR 251 & 259, 17 May 1978, 'Ibbin. JUMR 364, 2 September 1980, Al Jubayhah. JUMR 450, 1978, Dayr Abū Sa'īd. JUMR 600, 5 December 1980, Ma'ān. JUMR 615, 1980, Ar Ramthā. JUMR 631, 8 April 1981, Ayl. JUMR 705, 1981, Ma'ān. JUMR 841,

Table 16. Scale counts and measurements (mm) for *Platyceps collaris* specimens at Mu'tah University Museum.

Specimen No .	Sex	VS	CS	SV	T
MUM0070	♀	205	98	189	65
MUM0338	♂	197	106	590	260
MUM0341	♀	212	110	424	178
MUM0370	♀	209	92	578	210
MUM0430	♂	202	103	130	105

**Fig. 67.** Distribution of *Platyceps collaris* in Jordan.

15 October 1981, Dayr 'Allā. JUMR 862, 16 April 1982, 'Anjarah. JUMR 939, 15 July 1982, 'Aqrabā. JUMR 1142, June 1983, 'Aqrabā. JUMR 1259, June 1983, Al'āl. JUMR 1266, May 1983, Dayr Abū Sa'id. JUMR 1280, May 1983, Dayr Abū Sa'id. JUMR 1283, May 1983, Dayr Abū Sa'id. JUMR 1289, May 1983, Dayr Abū Sa'id. JUMR 1360, June 1983, Ma'an. JUMR 1573, May 1985, El Karāma. JUMR 1693, May 1986, Ma'in. JUMR 1728, August 1986, Şuwayliḥ. JUMR 1874, April 1988, Mādabā. JUMR 1903, April 1989, Yājūz. JUMR 1918, October 1989, 'Ammān. JUMR 2408, October 1993, Salihī. JNHM 212, 24 April 1982, Irbid. JUSTM 422, July 2006, Al Eisha.: MUM 0070–71, 1990, Ash Shawbak. MUM 0338, 27 June 1992, Aṭ Ṭafīla. MUM 0341, 1991, Rākīn. MUM 0343–344, July, 'Al'āl, Batīr. MUM 0370, 25 July 1992, Al Mazār. MUM 0430, 28 August 1993, Dilāghah.

New localities. Ajlūne Nature Reserve, Salihī, Yājūz.

Published records. Al Karak (BARBOUR, 1914), Al Mazār, Ash Shawbak, Aṭ Ṭafīla, Batīr, Dilāghah, Rākīn (EL ORAN *et al.*, 1994), Ash Shawbak, Ayl (AMR *et al.*, 1994), Dilāghah (AMR *et al.*, 1997a), Ayl, 'Al'āl, Al Jubayhah, 'Anjarah, Aqrabā, Dayr Abū Sa'id, Dayr 'Allā, 'Ibbīn, Irbid, Ma'an (DISI *et al.*, 2001), Dibbīn (DAMHOUREYEH *et al.*, 2009).

Materials recorded in other museums. HUJ-R 8293, Jordan, 1966, *leg.* H. ZINNER. HLMD J14, Jordan, no date. NHMW 20164:6, no date, "Ostjordanland" (= East Jordan), *leg.* K. FLOERICKE. ZFMK 44372, Dayr Abū Sa'id.

Systematics. This is a problematic species. For many years populations of "*C. rubriceps*" in the Middle East were considered as "*C. najadum*". *C. rubriceps* refers to the species distributed in Syria, Jordan, Lebanon and Palestine, parts of Turkey and into some parts of eastern Europe, where *P. najadum* coexists. *Platyceps collaris* (MÜLLER, 1878) was renamed as *Coluber collaris* by SCHÄTTI *et al.* (2001) based on molecular studies. Finally, the name of the species was changed to *Platyceps collaris* by SCHÄTTI & UTIGER (2001).

Diagnosis. Aglyphous. Head is relatively small and flat, hardly distinct from neck. Eyes are small with rounded pupil. Two to three PO, two PtO, one to two suboculars on the anterior edge of the eye. Seven to nine UL, 4th and 5th in contact with the eye. Nine LL. Body scales are smooth, with 19 MBS, VS 195–223, CS 72–119. Slim snake, with a long narrow tail. Maximum length may reach 100 cm. Table 16 shows scale counts and body measurements for *Platyceps collaris*.

Colouration. Reddish-gray to reddish-brown. A dark-light edged crossbars above the neck (Fig. 66). Three ocelli with white edges of different sizes extends alternately to first third of the body.

Habitats and ecology. This is a strictly Mediterranean species that prefers sunny, dry and rocky areas, with scarce vegetation and above an altitude of 1000 m. *P. collaris* is mainly a diurnal snake. In the Golan (Syria), *P. collaris* goes in hibernation during October, especially when it becomes recognizably cold, and move into their winter quarters (ESTERBAUER, 1986).

Biology. In Jordan, *Acanthodactylus* sp. and *Chamaeleo chamaeleon* were recovered from stomachs of this snake (AL-ORAN *et al.*, 1994; AMR & DISI, 1998). In the Golan, the Snake-eyed Lizard, *Ophisops elegans*, is its favorite food item. Adults feed on *Mabuya vittata*, *Ptyodactylus puiseuxi*, *Hemidactylus turcicus* and other smaller lizards, while juveniles feed on insects as dictated by the habitat (ESTERBAUER, 1986). ESTERBAUER (1986) described the feeding behavior of the Red Whip Snake; the snake seizes the prey

with its knife-sharp, backward pointing teeth, usually from the side of the body and then twists extremely fast around the prey. After two to three minutes the still moving prey is then swallowed head first. AMR *et al.* (1997a) reported on two occasions the aggregation behavior of the Red Whip Snake. This behavior was attributed to communal egg laying. Females lay their eggs in late June–early July. ESTERBAUER (1986) stated that eggs are laid towards the end of June and the beginning of July. The egg clutch usually consists of 2–5 longitudinal eggs, which are laid in rodent burrows or under stones. After six to eight weeks, newly hatched snakes (12 cm in length) emerge. Furthermore, ESTERBAUER (1986) gave a detailed account of the defence posture exhibited by *P. collaris*; when alarmed, it crawls a short distance while lifting up its head and anterior part of its body, then suddenly stands still, then swings its neck forwards and backwards repeatedly.

Remarks. *Platyceps collaris* is a problematic species. For many years, it was confused with *Platyceps najadum*, thus all previous records from Jordan and the Middle East were assigned as *P. najadum* (DISI *et al.*, 1988).

Platyceps elegantissimus (GÜNTHER, 1878)

Zamenis elegantissimus GÜNTHER, 1878. – Proceedings of the Zoological Society of London, **1878**: p. 977, pl. 57. – HART, 1891, Some Account of the Fauna and Flora of Sinai, Petra, and Wadi ‘Arabah, p. 209. – BOULENGER, 1893, Catalogue of the Snakes in the British Museum (Natural History), **1**: p. 403.

Coluber elegantissimus FLOWER, 1933. – Proceedings of the Zoological Society of London, **1933**: p. 811. – MARX, 1968, Special Publication US Naval Medical Research Unit 3, Cairo, p. 29. – GASPERETTI, 1988, Fauna of Saudi Arabia, **9**: p. 222. – LEVITON, ANDERSON, ADLER & MINTON, 1992, Handbook to the Middle East Amphibians and Reptiles, p. 90. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 253.

Haemorrhhis elegantissimus WELCH, 1983. – Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphisbaenia, Sauria and Serpentes, p. 68.

Platyceps elegantissimus VENCHI & SINDACO, 2006. – Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 285.

Common name. Most Beautiful Whip Snake

Range. Northern Arabia, Palestine and Jordan.

Distribution in Jordan. Fig. 69.

Material examined (N=1). MUM_0374, June 1992, El Quweira.



Fig. 68. The Most Beautiful Whip Snake, *Platyceps elegantissimus*, from Wādī Ramm.

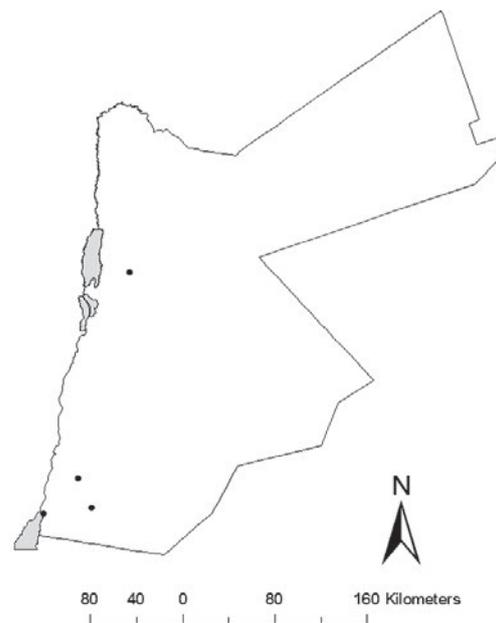


Fig. 69. Distribution of *Platyceps elegantissimus* in Jordan.

Published records. ‘Aqaba (HART, 1891; AL ORAN *et al.*, 1997), Wādī Al-Mujib (DISI *et al.*, 2001), Wādī Ramm (AMR *et al.*, 1994; ABU BAKER *et al.*, 2004).

Systematics. Based on morphology and molecular data (mtDNA), the Arabian endemics *Zamenis elegantissimus* GÜNTHER and *Z. variabilis* BOULENGER are referred to *Platyceps* BLYTH (SCHÄTTI & UTIGER, 2001).

Diagnosis. Aglyphous. This snake is of medium length with slender body, and round pupils. Rostral a little broader than deep, deeply hollowed out beneath, the portion visible from above nearly one third as long as its distance from the frontal; internasals a

little shorter than the prefrontals. Snout is strongly projecting and obtusely pointed. Loreal is as long as deep or longer. Two PtO, two PO, and one to two suboculars. Temporals 2+2 or 2+3. Eight UL, the 5th or the 4th and the 5th are in contact with the eye. Ten LL, where as five are in contact with the anterior chin shields. Posterior chin shields nearly as long as the anterior, separated from each other by two series of scales. MBS 19, VS 197–200, CS 79–85. Anal scale divided. Maximum total length may reach up to 70 cm. Measurements for MUM 0374: VS 187, CS 85, T 110, SV 315.

Colouration. Body is usually light gray to white, with 21–28 black crossbars on the head and body. Tail usually with 8–13 black bands (Fig. 68). Some specimens collected from Wādī Ramm showed a red-orange vertebral line that extends along the body. It seems that this is a genetically inherited character, since it can be either present or absent among individuals of the same population.

Habitats and ecology. One specimen was found submerged in water in Wādī Al Mujib. This species was collected from hard sandstone (Wādī Ramm) and rocky habitats (Wādī Al Mujib). The Most Beautiful Whip Snake is a nocturnal species. The Sinai Banded Snake, *P. sinai*, very similar to *P. elegantissimus*, was found to occur sympatrically along with the Most Beautiful Snake in Wādī Ramm (SINDACO *et al.*, 1995). In the region, it seems that its distribution is limited to the Afro-tropical Wādī ‘Araba, reaching the northern parts of the Dead Sea Mountains. In Wādī Ramm its occurrence is limited to south of Ra’s an Naqb.

Biology. Little is known about the biology of this snake. A sand gecko (*Stenodactylus doriae*) was recovered from the stomach of *P. elegantissimus* collected from Wādī Ramm (AMR & DISI, 1998). A specimen was observed swimming in Wādī Al Mujib. BABOCSAY *et al.* (2009) studied the behavior of two captive and fourteen, randomly encountered free-ranging specimens. They concluded that contrary to the belief that this species is nocturnal, *P. elegantissimus* conducts a predominantly diurnal, although cryptic, lifestyle.

Remarks. *P. elegantissimus* is considered as an endemic species due to its limited distribution in southern Jordan and Palestine, and in north-western and central Arabia (GASPERETTI, 1988). Its banded pattern is similar to those found among *Coluber thomasi* and *Coluber variabilis* in Arabia and *P. sinai* in Sinai, southern Palestine and Jordan. Further comparative studies are needed to establish phylogenetic



Fig. 70. Jan's Whip Snake, *Platyceps rhodorachis*, from Petra (D. Modrý).

relationship among those Arabian snakes. Despite the external similarities between this snake and the Sinai Whip Snake, WERNER & SIVAN (1991) established various criteria for differentiating between the two snakes, including the number of crossbars on the body, the rows of scales, and the type and size of the eyes. For example, *P. elegantissimus* has 19 rows of scales and fewer than 40 dark crossbars, while the *P. sinai* has 17 rows of scales and more than 60 dark crossbars.

Platyceps rhodorachis (JAN, 1865)

Zamenis rhodorachis JAN, 1865 in De Filippi, Viagg. Pers. p. 356.

Zamenis ventrimaculatus BOULENGER, 1893. – Catalogue of the Snakes in the British Museum (Natural History), 1: p. 398.

Coluber rhodorachis PARKER, 1931. – Annals and Magazine of Natural History, 10: p. 516. – FLOWER, 1933, Proceedings of the Zoological Society of London, 1933: p. 809. – SCHLEICH, KÄSTLE & KABISCH, 1996, Amphibians and Reptiles of North Africa, p. 484. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 265.

Coluber rhodorachis rhodorachis: MARX, 1968. – Special Publication US Naval Medical Research Unit 3, Cairo, p. 31. – WERNER, 1982, U.S.F.W.S., Wildlife Research Report, 13: p. 156. – DISI, AMR & DEFOSSÉ, 1988, The Snake, 20: p. 45. – GASPERETTI, 1988, Fauna of Saudi Arabia, 9: p. 219. – STEIN & HELMY, 1994, Bulletin of the Maryland Herpetological Society, 3: p. 18.

Haemorrhais rhodorachis WELCH, 1983. – Herpetology of Europe and southwest Asia: a checklist and bibliography of the orders Amphisbaenia, Sauria and Serpentes, p. 69.

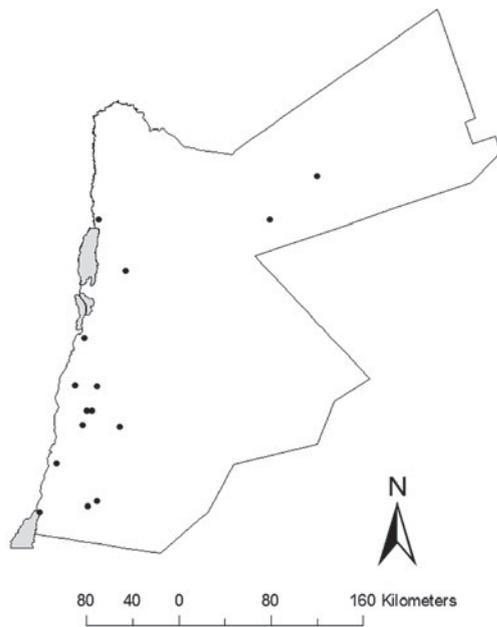
Common name. Jan's Whip Snake, Jan's Desert-racer, Cliff Racer.

Range. Libya to northwestern India and Syria to the Arabian Peninsula.

Distribution in Jordan. Fig. 71.

Table 17. Scale counts and measurements (mm) for *Platyceps rhodorachis* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0072	♂	218	127	305	105
MUM0366	♀	242	140	655	295
MUM0367	♀	252	148	667	275

**Fig. 71.** Distribution of *Platyceps rhodorachis* in Jordan.

Material examined (N=23). JUMR 863, 17 April 1982, Ma'in. JUMR 976, 31 August 1982, Wādī Khuneizīra. JUMR 1083, 13 September 1982, Wādī Fidān. JUMR 1140, 22 December 1982, Raḥmah. JUMR 1270, May 1983, Ghawr Al Wasat. JUMR 1327–1328, May 1983, Ar Ramthā. JUMR 1358, June 1983, El Jafr. JUMR 1372, June 1983, Khaw. JUMR 1569–1571, May 1985, El Karāma. JUMR 1889, November 1983, Wādī Sha'eb Dam. JUMR 2017–2018, 1991, El Karāma. JUSTM 398, June 1997, Wādī ad Dulayl. JUSTM 417, 2002, Wādī Ramm. MUM 0014, 1978, El-Naqah. MUM 0072, 1990, Ash Shawbak. MUM 0083, 10 July 1991, Ad Dīсах. MUM 0366–367, 17 July 1992, 'Aqaba. MUM 0371, 2 May 1992, Ma'an.

New localities. Al Hazīm, Al Magtas, Bequwyeh, Jabal Mas'ūdah.

Published records. Petra (WERNER, 1971), Ghawr Al Wasat, Ghawr Nimreen, Raḥmah, Wādī Fidān, Wādī Khuneizīra (DISI *et al.*, 1988), Petra (GASPERETTI, 1988), Ad Dīсах, Ash Shawbak, Wādī Mūsá (AMR *et al.*, 1994), 'Aqaba, Ad Dīсах, Ash Shawbak, El Nageh, Ma'an (EL ORAN *et al.*, 1994), Wādī Ramm (SINDACO *et al.*, 1995), Wādī Fidān, Wādī Khuneizīra (AL ORAN *et al.*, 1997), Wādī Ramm (ABU BAKER *et al.*, 2004), Petra, Wādī Musa (DISI *et al.*, 2001).

Materials recorded in other museums. BM 1965.805, Petra, 1965, *leg.* D. WESTERN. MCC/R635, Wādī Ramm, 3 May 1994, *leg.* R. SINDACO & N. FEDRIGHINI. SMF 76452, East Jordan, 11 July 1968, *leg.* J. KLAPPERICH.

Systematics. KHAN (1997) presented a taxonomic treatment on the *rhodorachis-ventromaculatus* species complex of the genus *Coluber*. He concluded that *C. rhodorachis* is a widespread species with a range extending from North Africa through Arabia to Iran, Pakistan and Transcaspia and Transcaucasia to Kashmir and Nepal. Furthermore, he stated that *C. ventromaculatus* and *C. rhodorachis* are sometimes indistinguishably integrated into each other in general appearance as well as scale counts. He concluded that all *ventromaculatus* reported west of the Indus are colour forms of *rhodorachis*, and *C. ventromaculatus* is absent (KHAN, 1997). DISI *et al.* (2001) shared this opinion and considered all the *ventromaculatus* records from Jordan as *rhodorachis*.

Diagnosis. Aglyphous. Long, slender snake with rounded pupils. Snout is usually narrow and pointed. Loreal is longer than deep. Two PtO. Temporals 2+2 or 2+3. Nine UL, the 5th and 6th entering the eye. Ten LL, 4th and 5th are in contact with the anterior chin shields. MBS 19 rows, VS 205–262, CS 113–154. Anal scale divided. Total length may reach 130 cm. Table 17 shows scale counts and body measurements for *Platyceps rhodorachis*.

Colouration. Head is usually dark gray with three dark bars on both sides. The anterior portion of the body is covered with about 80 transverse bars, each bar is consists of closely spaced spots (Fig. 70). The last third of the body is a uniformly pale sandy colour terminating with a pink tail.

Habitats and ecology. A diurnal or crepuscular species that inhabits extremely dry rocky and stony habitats. It was found close to irrigation canals and pools in agricultural projects in the remote deserts of Wādī Ramm. In Petra the Cliff Racer is common and was observed in the afternoon moving in rocky places and hard to-reach boulders. Also in Petra, this snake inhabits rocky crevices, where it hangs in the open air and a specimen was seen diving into water as it left its crevices.

Biology. Little is known about the biology of this snake. It feeds on skinks, *Eumeces schneiderii*, small mammals and birds (SCHLEICH *et al.*, 1996). The di-

urnal activity of the Cliff Racer may suggest that it feeds on lizards active in the day-time. When followed, it escapes at an incredible speed, taking refuge in rocks or crevices. Females are oviparous, laying 3–7 eggs (LATIFI, 1991).

Remarks. SCHÄTTI & MCCARTHY (2004) considered *Platyceps rhodorhachis* as a complex of taxa ranging from North Africa to extreme southern Kazakhstan and northwest India. A significant geographic discontinuity occurs in the Middle East including Iraq, Arabia and Jordan that requires additional data to distinguish these populations.

Platyceps rogersi (ANDERSON, 1893)

Zamenis rogersi ANDERSON, 1893. – Annals and Magazine of Natural History, **12**: p. 439.

Coluber rogersi FLOWER, 1933. – Proceedings of the Zoological Society of London, **1933**: p. 810. – DISI, AMR & DEFOSSE, 1988, The Snake, **20**: p. 45. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 88. – LEVITON, ANDERSON, ADLER & MINTON, 1992, Handbook to the Middle East Amphibians and Reptiles, p. 92. – SCHLEICH, KÄSTLE & KABISCH, 1996, Amphibians and Reptiles of North Africa, p. 486. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 267.

Haemorrhhis rogersi WELCH, 1983. – Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphibia, Sauria and Serpentes, p. 69.

Platyceps rogersi VENCHI & SINDACO, 2006. – Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 287.

Common name. Anderson’s Whip Snake, Roger’s Snake.

Range. Libya, Egypt, Syria, Western Iraq, Jordan and Palestine.

Distribution in Jordan. Fig. 73.

Material examined (N=22). JUMR 370, June 1979, Shawmarī. JUMR 373, 1979, Wādī Mūsá area. JUMR 546, June 1979, Shawmarī. JUMR 491, June 1979, Shawmarī. JUMR 699, 1982, Ma’an. JUMR 769, September 1981, ‘Ammān. JUMR 863, 17 April 1982, Mā’in. JUMR 905, May 1982, Jāwá. JUMR 922, Al Khaldeyeh, June 1982. JUMR 931, 1 July 1983, Jāwá. JUMR 1088, 23 September 1983, Al’al. JUMR 1140, 22 December 1980, Wādī ‘Araba. JUMR 1270, May 1983, Dayr Abū Sa’id. JUMR 1368, June 1983, Ma’an. JUMR 1324, May 1982, Ar Ramthā. JUMR 1327, May 1983, Ar Ramthā. JUMR 1372, June 1983, Khaw. JUMR 1385, June 1983, Al Jafr. JUMR 1649, June 1985, 10 km from ‘Unayzah along Ash Shawbak Highway. JUMR 1736, July 1986, Qaṣr al Hallābāt. JUMR 1898, August 1987, Al Khaldeyeh. JUSTM 034, 12 October 1992, Wādī Sha’eb.

New localities. Al Hiṣn, Kuraymah, Wādī Al Muḡib.



Fig. 72. Roger’s Snake, *Platyceps rogersi*, from Palmyra, Syria (A. SHEHAB).

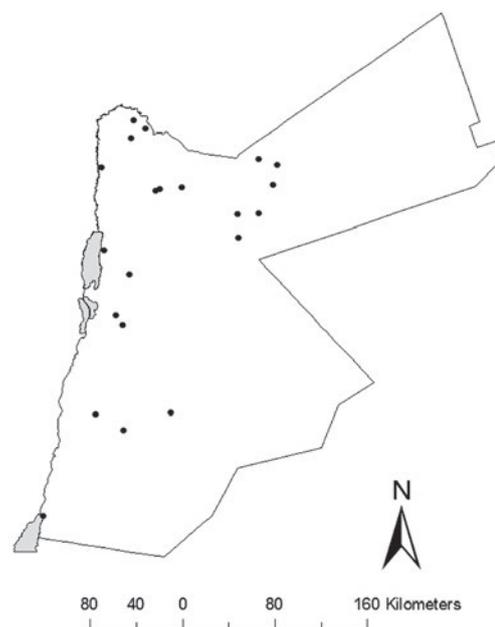


Fig. 73. Distribution of *Platyceps rogersi* in Jordan.

Published records. Wadi Dhaba’ (HAAS, 1951), Azraq, Az Zarqā’, 5 km S of Aseikhim (= Al Useikhim), 65 km SSE ‘Ammān (WERNER, 1971), ‘Al’al, Al Jafr, Ar Ramthā, Shawmarī, Jāwá, Mā’in (DISI *et al.*, 1988), Al Khaldeyeh, Ar Ramthā, Ma’an area, Qaṣr al Hallābāt, Shawmarī, Wādī Mūsá, 10 km from ‘Unayzah along Ash Shawbak Highway (DISI, 1993), Mu’tah (AMR *et al.*, 1994), Jāwá, Shawmarī, Shubeika (DISI *et al.*, 1999), Dayr Abū Sa’id, Safawi (DISI *et al.*, 2001).

Materials recorded in other museums. CAS 147590, before December 1977, Azraq, *leg.* F.A. WAZANI (listed as *Coluber ventromaculatus*). BM 1965.698, April–May 1965, 5 km S of Aseikhim (= Al Useikhim), S. BISSERÔT. BM 1965.806, 1965, Azraq, *leg.* D. WESTERN. HUIJ-R 3183, 65 km SSE of ‘Ammān, June 1938, *leg.* G. HAAS. HUIJ-R 21259, 65 miles SSE Ammān, June 1938, *leg.* G. HAAS. ZFMK 44376, Ma’an. ZFMK 80871, Jordan (not a specified locality).

Systematics. On the basis of molecular data SCHÄTTI & UTIGER (2001), showed that *P. rogersi* is well differentiated from *P. ventromaculatus*, while similar to the North African *P. karelini*. Their findings strongly supported sister taxon relationship between *P. karelini*

and the Arabian *P. rogersi*, thus excluding *P. rhodorachis* from the clade.

Diagnosis. This is a long and thin snake. Head is narrow and distinct from neck, eyes medium-sized with rounded pupils. One loreal and one preocular are present. One small subocular situated above the 4th UL. Two PtO. Eight to nine UL, the 4th and 5th are in contact with the eye. Body scales are smooth, 17–19 MBS. Maximum length may reach up to 100 cm. VS 194–211, CS 82–119.

Colouration. Body is usually gray-brown to olive-brown. The dorsal pattern consists of spots that form dark strips across the body that usually have a light edge. The lateral sides have smaller rhomboid spots alternating with the dorsal pattern. Both sides of the head and the neck are orange. A dark strip extends from the lower edge of the eye into the end of the mouth. A band extends backwards on both sides of the head. Ventral side is white-cream (Fig. 72).

Habitats and ecology. Roger's Snake inhabits rocky or stony hills, hamada and steppes. It is usually diurnal, but becomes nocturnal during warm months (SCHLEICH *et al.*, 1996).

Biology. This snake was found to feed on different lacertids, geckos, frogs and toad (SCHLEICH *et al.*, 1996). A clutch of five eggs was reported by GRUPER (1989).

Remarks. DISI *et al.* (2001) considered all previous records of *P. ventromaculatus* from Jordan as *P. rogersi*. As pointed out by DISI *et al.* (2001), in the literature there are no reliable diagnostic characters to distinguish *P. rogersi* from *P. ventromaculatus* (GRAY, 1834).

Platyceps sinai (SCHMIDT & MARX, 1956)

Lytorhynchus sinai SCHMIDT & MARX, 1956. – Fieldiana, Zoology, **39**: p. 30.

Coluber sinai MARX, 1968. – Special Publication US Naval Medical Research Unit 3, p. 32. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 273.

Haemorrhhis sinai WELCH, 1983. – Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphisbaenia, Sauria and Serpentes, p. 69.

Coluber (s.l.) *sinai* VENCHI & SINDACO, 2006. – Annali del Museo Civico di Storia Naturale "G. Doria", Genova, **98**: p. *Platyceps sinai* BAHA EL DIN, 2006. – A Guide to the Reptiles and Amphibians of Egypt, p. 258.



Fig. 74. Sinai Banded Snake, *Platyceps sinai*, from Wādī Ramm (R. SINDACO).

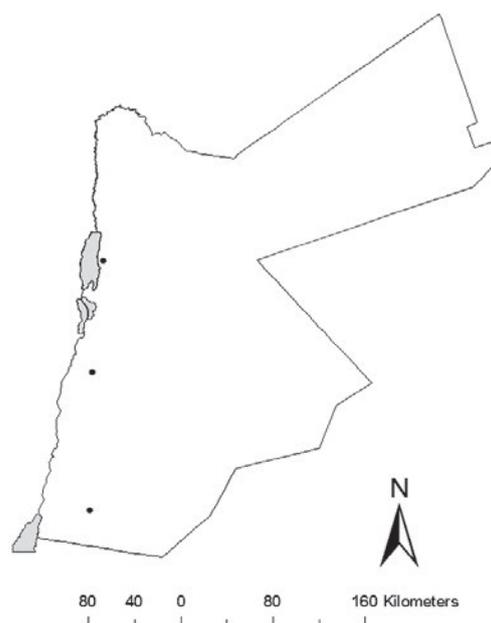


Fig. 75. Distribution of *Platyceps sinai* in Jordan.

Common name. Sinai Banded Snake.

Range. Southern and eastern Sinai, West of Wādī 'Araba and southern Jordan (SINDACO *et al.*, 1995).

Distribution in Jordan. Fig. 75.

Published records. Mouth of Wādī Al Mujib (WERNER, 1998), Wādī Ramm (SINDACO *et al.*, 1995; ABU BAKER *et al.*, 2004).

Materials recorded in other museums. HUIJ-R 21020, Mouth of Wādī Al Mujib, July 1996, *leg.* A. SHMIDA. HUIJ-R 21050, Wadi Ghoer ~8 km NNW of Shawbak (= Ash Shawbak), 5 km WSW of Funon, 29 November 1997, *leg.* D. GOTLIEB & A. SHMIDA. MCC/R629, Wādī Ramm (= Rum), surroundings of the Government Rest House, 1 May 1994, *leg.* R. SINDACO & N. FEDRIGHINI.

Systematics. Originally this species was described under the genus *Lytorhynchus* due to the presence of a triangular rostrum (SCHMIDT & MARX 1956).

Diagnosis. Head pointed, slightly distinct from the slender body, tail a little more than one-fourth the total length; eye relatively large, its diameter nearly twice its distance from the labial border. Rostral with a triangular posterior projection between the internasals, its borders only slightly raised. Internasals two-thirds as long as prefrontals, their suture one-half that of the prefrontals. Frontal five-sided, slightly longer than its distance from the snout, the lateral sides nearly parallel. Parietals nearly rectangular, their sides nearly parallel; nasal divided. Loreal longer than high. Two PO, the upper distinctly in contact with the frontal, the lower very small; two postoculars; two elongate anterior temporals followed by three in the next row on both sides. Eight UL, 4th and 5th entering the eye. Ten LL, first five in contact with anterior chinshields; chinshields elongate, posterior pair as long as anterior, widely separated. MBS 17, VS 172–181, CS 86–98. 42–51 black crossbars on the head and body, and 20–28 on the tail. Maximum length may reach up to 53 cm.

Colouration. Ground colour white with black transverse dorsal crossbars two scale lengths long, extending onto the sides of the ventrals, separated anteriorly by three scale lengths, their width decreasing posteriorly to one scale length and their separation increasing to four scale lengths. Crossbars on body 50, on tail 24 (Fig. 74). Orange vertebral line present. Cross bands are 3.5–4 scales in width in body region, while one scale on the tail (SINDACO *et al.*, 1995).

Habitats and ecology. SINDACO *et al.* (1995) collected a single specimen from an area with granitic rock and sandstone in Wādī Ramm. WERNER (1998) reported on a specimen caught at the mouth of Wādī Al Mujib. This area is very arid with sharp mountainous ridges. In this locality, the Sinai Banded Snake was found syntopically with other reptiles (*Pristurus rupestris*, *Laudakia stellio*, *Pseudotrapelus sinaitus* and *P. rhodorachis*). BAHA EL DIN (1994) concluded their activity is crepuscular based on recent road-killed specimens from Sinai.

Biology. A specimen was found to contain a half digested Rüppell's Snake-eyed Skink, *Ablepharus rueppellii* (BAHA EL DIN, 2006).

Remarks. SINDACO *et al.* (1995) referred to the lack of morphological description of *P. elegantissimus* specimens collected from Wādī Ramm by AMR *et al.* (1994) and AL-ORAN *et al.* (1994). We re-examined these specimens and all were indeed *P. elegantissimus*. This substantiates SINDACO's findings on the syntopy of these two similar snakes. WERNER &



Fig. 76. Forskål's Sand Snake, *Psammophis schokari*, from Bequwyeh.

SIVAN (1991) explained on the confusion that many herpetologist fall into regarding this species.

Genus *Psammophis* BOIE, 1826

Opisthoglyphous. Two large, hollow fangs are situated below the posterior border of the eye. Head is elongate and distinct from neck. Eyes are relatively large with rounded pupils. Body is cylindrical, with a long tail, covered by smooth scales. Species of this genus are distributed throughout North Africa, across the Arabian Peninsula to northwestern India. In Jordan as well as the neighboring countries (Syria, Iraq, Palestine and the Arabian Peninsula), the genus *Psammophis* is represented by a single species, *Psammophis schokari*. However, different species are known to occur in Sinai and North Africa (MARX, 1958).

Psammophis schokari (FORSKÅL, 1775)

Coluber schokari FORSKÅL, 1775. – Descr. Anim., p. 14.

Psammophis schokari BOULENGER, 1896. – Catalogue of the Snakes in the British Museum (Natural History), **3**: p. 157. – DISI, AMR & DEFOSSÉ, 1988, *The Snake*, **20**: p. 47. – LEVITON, ANDERSON, ADLER & MINTON, 1992, *Handbook to the Middle East Amphibians and Reptiles*, p. 102. – SCHLEICH, KÄSTLE & KABISCH, 1996, *Amphibians and Reptiles of North Africa*, p. 515. – DISI, MODRÝ, NEČAS & REFAI, 2001, *Amphibians and Reptiles of the Hashemite Kingdom of Jordan*, p. 301. – VENCHI & SINDACO, 2006, *Annali del Museo Civico di Storia Naturale "G. Doria"*, Genova, **98**: p. 289.

Common name. Forskål's Sand Snake, Schokari Sand Snake, Afro-Asian Sand Snake.

Table 18. Scale counts and measurements (mm) for *Psammophis schokari* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0005	♂	160	112	277	138
MUM0011	♂	162	na	573	217
MUM0097	♂	169	na	335	157
MUM0130	♀	184	109	297	123
MUM0173	♂	168	114	530	240
MUM0174	♀	176	109	480	222
MUM0323	♀	172	111	560	210
MUM0340	♀	175	115	595	235
MUM0406	♀	179	119	450	30

Range. The range of this species extends from North Africa to India and Syria to the Arabian Peninsula.

Distribution in Jordan. Fig. 77.

Material examined (N=30). JUMR 82, 17 March 1978, Ra's an Naqb. JUMR 84, 17 March 1978, Ra's an Naqb. JUMR 364, 2 September 1980, Al Jubayhah. JUMR 446, no date, Dayr Abū Sa'īd. JUMR 677, 6 June 1981, Jāwá. JUMR 698, 6 June 1981, Jāwá. JUMR 700, 1981, Ma'ān. JUMR 929, 6 June 1981, Jāwá. JUMR 1253, 27 March 1980, Al'al. JUMR 1255, September 1982, Ar Ramthā. JUMR 1290, May 1983, Dayr Abū Sa'īd. JUMR 1311, June 1983, 15 Km N Azraq. JUMR 1864, November 1988, Wādī Al Mujib. JUMR 1920, 1989, Kuraymah. JUMR 2360, 1985, Kafr al Mā'. MUM 005, 26 May 1991, Ghawr aş Şāfi. MUM 0011, 26 May 1991, El Nageh. MUM 0097, 11 July 1991, El Quweira. MUM 0130–131, 17 August 1991, Al Jafr. MUM 0145, 18 August 1991, Ma'ān. MUM 0173–175, 20 September 1991, Al Jafr. MUM 0323, 17 April 1990, Aṭ Ṭāfila. MUM 0340; 24 January 1992, El Shehabieh. MUM 0402, 21 August 1992, Mu'tah. MUM 0406, February 1993, Aṭ Ṭayyibah. JUSTM 020, 20 September 1991, Al Jafr. JUSTM 393, 21 September 1996, Al Bathayah.

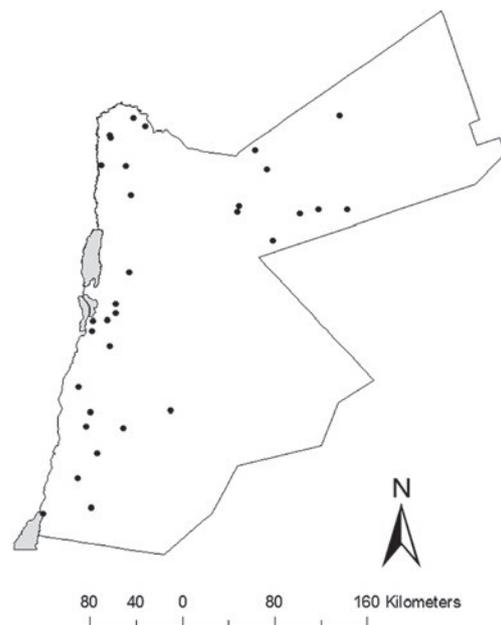
New localities. 'Aqaba, Bequwyeh, Petra, Qaşr Burqu'.

Published records. 'Aqaba, Petra (BARBOUR, 1914), Guwiera (= El Quweira) (HAAS, 1943), Azraq (Nelson, 1973), Al Jafr, El Quweira, Ma'ān (AMR *et al.*, 1994), Al Jafr, Aṭ Ṭāfila, Aṭ Ṭayyibah, El Nageh, El Shehabieh, Ghawr aş Şāfi, Ma'ān, Mu'tah, (EL ORAN *et al.*, 1994), Wādī Fidān (AL ORAN *et al.*, 1997), Al Hazīm, Safawi, Shawmarī, Wādī Anaza, Wādī al Qaṭṭāfi (DISI *et al.*, 1999), Wādī Ramm (ABU BAKER *et al.*, 2004).

Materials recorded in other museums. MCZ R-9689, January 1914–31 December 1914, Petra, *leg.* J. C. PHILLIPS & W. M. MANN.

Systematics. MARX (1988) demonstrated the presence of three Arabian groups of *Psammophis* by using cluster analysis. He suggested that Arabian groups should be considered separately.

Diagnosis. Opisthoglyphous. Long, thin snake with a flat head. Eyes are relatively large with a rounded pupil. Eight to ten upper labials, 5th and 6th entering the eye. Rostral broader than deep, visible from above.

**Fig. 77.** Distribution of *Psammophis schokari* in Jordan.

Nostril between two or three shields; internasals much shorter than the prefrontals. Frontal twice to two and a half as long as broad, about half as broad, in the middle, as the supocular, as long as or a little longer than its distance from the end of the snout, as long as the parietals. Loreal three to four times as long as deep. One PO (rarely divided), in contact with the frontal; two (rarely three) PtO. Temporals 2+2 or 3 (rarely 1+2). Nine (rarely eight or ten) UL, 3rd or 4th deepest, usually 3rd, 4th and 5th in contact with the preocular, 5th and 6th (rarely 4th and 5th or 6th and 7th) entering the eye. Five or six LL in contact with the anterior chinshields, which are shorter than the posterior (Fig. 78). One elongated loreal, three to four times as long as wide. Scale rows 17, VS 162–194 (160–173 in males and 162–180 in females), CS 95–149 (106–121 in males and 104–116 in females). Anal divided. Maximum length may reach 150 cm. Table

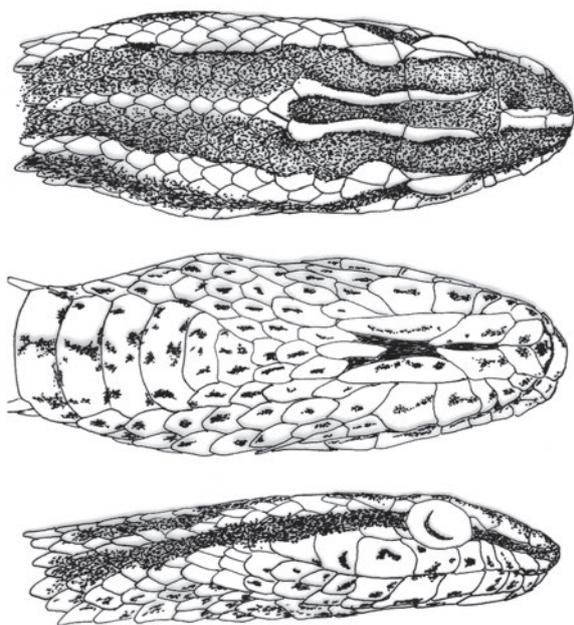


Fig. 78. Lateral, dorsal and ventral views of the head of *Psammophis schokari*, from Bequwyeh.

18 shows scale counts and body measurements for *Psammophis schokari*.

Colouration. Live specimens may show a green strip extending from the eye to the nape, a yellow line extends dorsally with parallel green and yellow lines (Fig. 76). Ventral is usually sprinkled with very small reddish-brown spots. A dark, narrow longitudinal band extends on both sides of head.

Habitats and ecology. *Psammophis schokari* is a diurnal species. It was observed in arboreal postures on bushes and shrubs (GASPERETTI, 1988). This species was thought to be restricted to desert habitats, however, in Jordan the Forskål's Sand Snake has a wide range, occupying a variety of ecological habitats (Mediterranean, Saharo-Sindian, Irano-Turanian and Sudanian region). It was observed during daytime under bushes of *Nitraria retusa* in Al Hazīm, eastern Jordan. One individual was seen elevating its head, with the body stretched vertically on black basalt wall near Safawi around mid day where temperature was around 36° C.

Biology. This snake is active during daytime as well as at night. Females are oviparous, laying 2–6 eggs (LATIFI, 1991). COTTONE & BAUER (2008) dissected and studied museum specimens of *P. schokari*. They found that this species is an opportunistic feeder, but preys mainly on lizards. Both sexes display their highest levels of sexual activity in synchrony and exhibit pre-nuptial spermiogenesis and a Type 1 vitel-

logenic cycle, respectively. They stated that mating takes place at the end of the rainy season and clutch sizes are small.

Remarks. LEVITON & ANDERSON (1967) suggested the presence of three populations of tree snakes, with variations in scale counts. KARK *et al.* (1997) discussed polymorphism among *P. schokari*, and found three phenotypically indistinguishable morphs: striped, non-striped, and rear-striped populations. They attributed such morphs to be correlated to rainfall, solar radiation and vegetation.

Genus *Rhagerhis* PETERS, 1862

For many years, *Rhagerhis moilensis* has been congeneric with *Malpolon monspessulanus*. BÖHME & DE PURY (2011) allocated *Rhagerhis moilensis* to accommodate its type species *Coelopeltis productus*. Main diagnostic characters for this genus include the skull structure that formed the typical head shape of *Rhagerhis moilensis*, the longer neck ribs (3 mm longer than in equal-sized *Malpolon*), that allows the spreading of the neck, and the pattern of the dorsal scale which is drastically different in *Rhagerhis moilensis* than both *Malpolon insignitus* and *M. monspessulanus*.

Rhagerhis moilensis (REUSS, 1834)

Coluber moilensis REUSS, 1834. – Mus. Senck., 1: p. 142.

Coelopeltis moilensis BOULENGER, 1896. – Catalogue of the Snakes in the British Museum (Natural History), 3: p. 143.

Malpolon moilensis PARKER, 1931. – Annals and Magazine of Natural History, (10), 8: p. 522. – DISI, AMR & DEFOSSÉ, 1988, The Snake, 20: p. 46. – LEVITON, ANDERSON, ADLER & MINTON, 1992, Handbook to the Middle East Amphibians and Reptiles, p. 99. – SCHLEICH, KÄSTLE & KABISCH, 1996, Amphibians and Reptiles of North Africa, p. 499. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 291. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, 98: p. 282.

Rhagerhis moilensis KELLY *et al.*, 2008. – Molecular Phylogenetics and Evolution, 47: p. 1055. – BÖHME & DE PURY, 2011, Salamandra, 47: p. 120.

Common name. Moila Snake, False Cobra.

Range. Algeria, Egypt, Sudan to Southwest Asia including southwestern Iran.

Distribution in Jordan. Fig. 80.

Table 19. Scale counts and measurements (mm) for *Rhagerhis moilensis* for specimens at Mu'tah University Museum.

Specimen No..	Sex	VS	CS	SV	T
MUM0074	♀	172	72	382	126
MUM0132	♂	167	54	305	68
MUM0133	♂	166	54	232	48
MUM0140	♂	164	53	708	170
MUM0408	♂	165	59	367	83
MUM0418	♂	162	53	310	70

**Fig. 79.** Moila Snake, *Rhagerhis moilensis*, from 'Aqaba.

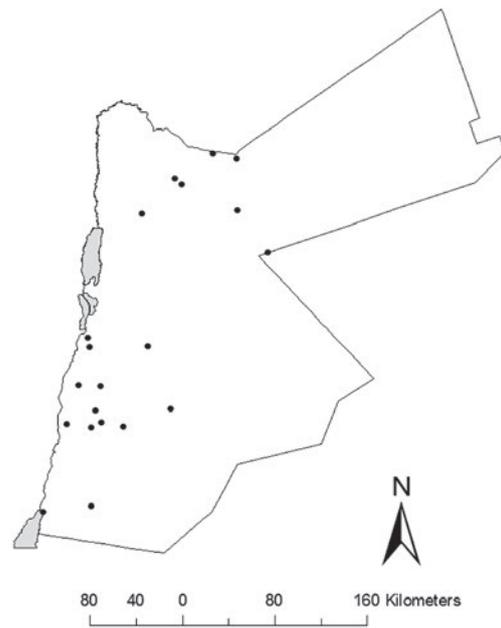
Material examined (N=12). JUMR 366, 10 May 1979, Shawmarī Wildlife Reserve. JUMR 374, Wādī Mūsá, 1979. JUMR 587, 4 April 1980, Basta. JUMR 1126, October 1982, Wādī ad Dulayl. MUM 0074, 1991, Ar Rājif. MUM 0129 & 0132, 17 August 1991, Al Jafr. MUM 0133 & 0140, 18 July 1991, Ma'an. MUM 0408, 12 January 1991, al Ḥaṣāh. MUM 0418, 16 August 1991, Ma'an. JUSTM 394, June 1997, al Bustānah Reserve.

New localities. Al Muwaqqar, 'Aqaba, Qaṣr 'Amra, 10 km from Azraq, between Shawmarī and al 'Umarī.

Published records. 3 mile N of Azraq ad Durūz (WERNER, 1971), Azraq (NELSON, 1973) Shawmarī Wildlife Reserve, Basta, Dhahel, Qā' as Sa'dīyīn, Wādī Khuneizīra, Wādī Mūsá (DISI *et al.* 1988), al Ḥaṣāh, Al Jafr, Ar Rājif, Ma'an (EL ORAN *et al.*, 1994), Al Jafr, Ash Shawbak, Ma'an, Wādī Mūsá (AMR *et al.*, 1994), Wādī Fidān, Wādī Khuneizīra (AL ORAN *et al.*, 1997), Dayr Al Kahf, Jāwá, Shawmarī Wildlife Reserve, Umm al Qiṭṭayn, Wādī ad Dulayl, between Qaṣr al Ḥallābāt (DISI *et al.*, 1999).

Materials recorded in other museum. CAS 147591, before December 1977, Azraq, *leg.* F.A. WAZANI. BM 1965.697, April-May 1965, 3 miles N of Druze (= Azraq ad Durūz), *leg.* S. BISSERÔT.

Systematics. KRAMER & SCHNURRENBERGER (1963) indicated that *R. moilensis* is more closely related to *Rhamphiophis oxyrhynchus* in several aspects including dentition, scalation and defensive behavior than to *M. monspessulanus*. Recently, KELLY *et al.* (2008) clearly demonstrated that *R. moilensis* forms a distinct clade as compared to the species of its sister taxon *Malpolon*. BÖHME & DE PURY (2011) al-

**Fig. 80.** Distribution of *Rhagerhis moilensis* in Jordan.

located *moilensis* into the genus *Rhagerhis* based on other characters including skull structure, elongated neck ribs that are on average 3 mm longer than in equal-sized *Malpolon*, that facilitate the spreading of the neck into a hood-shaped and the dorsal scale microdermatoglyphic pattern that is drastically different from both *Malpolon insignitus* and *M. monspessulanus*.

Diagnosis. Opisthoglyphous. Body is elongated and cylindrical. Eyes are relatively large with rounded pupils. Head is elongated and is distinct from the neck (Fig. 79). Snout protrudes over the mental and obtusely pointed. Rostral at least as deep as broad, wedged in between the internasals. Frontal as broad as the supraocular, twice as long as broad, its long as or a little longer than its distance from the end of the snout, as long as or a little longer than the parietals. Forehead is convex. One loreal, one or rarely two PO, two or three PtO. Temporals 1+2, 2+3 or 2+4. Seven to eight UL, the 4th and the 5th (or 3rd and 4th) enter the eye. Four or five LL in contact with the an-

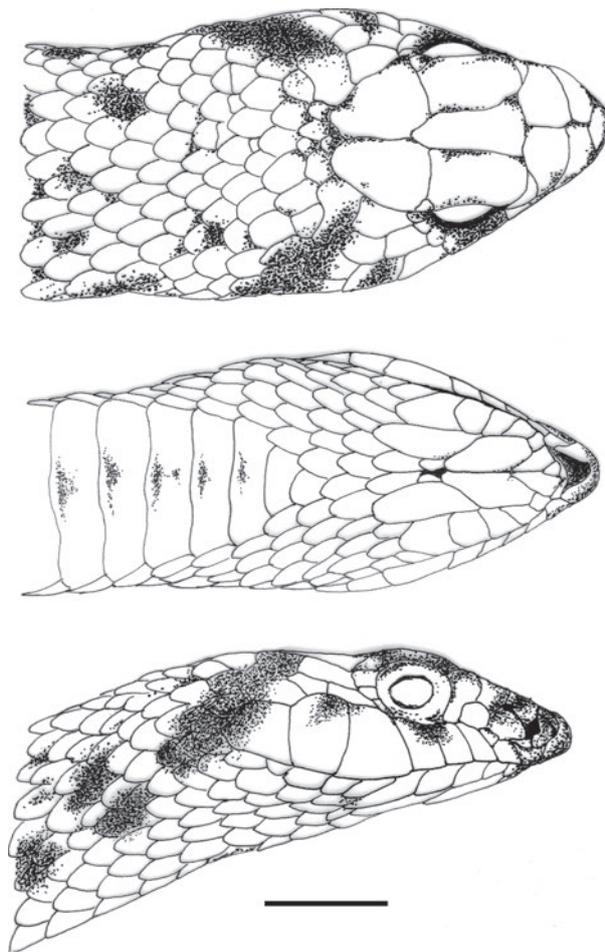


Fig. 81. Lateral, dorsal and ventral views of the head of *Rhagerhis moilensis* from 'Aqaba.

terior chin shields (Fig. 81). Dorsal scales in 17 rows, VS 152–180, CS 48–73, scale smooth entirely. Anal divided. Table 19 shows scale counts and body measurements for *Rhagerhis moilensis*. Maximum length can reach up to 100 cm.

Colouration. Usually sandy, light to dark, with spots dorsally of irregular pattern. A dark brown spot located between the eye and the neck is very distinctive in this species.

Habitats and ecology. This is a diurnal snake; however, it becomes crepuscular during hot seasons (GASPERETTI, 1988). *Rhagerhis moilensis* exhibits cobra-like posture when alarmed. This snake is adapted for desert and arid environments. In Jordan, it occurs in the Saharo-Arabian as well as some limited areas within the Irano-Turanian biotopes. In Al Jafr area it was observed during the daytime basking under bushes of *Haloxylon persicum*. Specimens were recovered from deep burrows reaching 125 cm long and 55 cm deep (BAHA EL DIN, 1996).

Biology. In captivity, the Moila Snake fed readily on suckling mice. In North Africa, it feeds on a wide variety of reptiles including lizards, geckos as well as other snakes, birds and rodents (SCHLEICH *et al.*, 1996). The authors recovered nine eggs from a female collected from Shawmarī Wildlife Reserve. Females lay 4–18 eggs in July to August (SCHLEICH *et al.*, 1996).

Remarks. WOERKOM (1982) stated that Arabian specimens of both sexes showed higher scale counts (164–174 in males and 174–180 in females) than North African specimens (152–162 in males and 157–174 in females). Generally specimens with higher ventral scale counts are females.

Genus *Rhynchocalamus* GÜNTHER 1864

Aglyphous. Head small and not distinct from neck. Eyes are small with rounded pupils. Nasal undivided. Body is thin and cylindrical with a short tail. Dorsal scales are smooth in 15 rows. Anal plate and subcaudal scales are divided.

Rhynchocalamus melanocephalus (JAN, 1862)

Homalosoma melanocephalum JAN, 1862. – Arch. Zool., Anat. Fisiol., 2: p. 33.

Contia satunini NIKOLSKY, 1899. – Annuaire Musée Zoologique de l'Académie Impériale des Sciences de St.-Petersbourg, 4: 449.

Rhynchocalamus melanocephalus DISI, AMR & DEFOSSE, 1988. – The Snake, 20: p. 47. – GASPERETTI, 1988, Fauna of Saudi Arabia, 9: p. 270. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 303. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale "G. Doria", Genova, 98: p. 291.

Common name. Black-headed Dwarf Snake, Palestine Black-headed Snake.

Range. Palestine, Jordan, northern Saudi Arabia, Lebanon, Syria.

Distribution in Jordan. Fig. 83.

Material examined (N=11). JUMR 586, 4 April 1980, Basta. JUMR 634, 3 April 1981, Ayl. JUMR 868, 3 May 1982, Jarash. JUMR 1167, 1982, Dayr Abū Sa'īd. JUMR 1376, 21 April 1979, Al Jubayhah. JUMR 1912, July 1989, 'Ammān. JUMR 1955, November 1990, Jarash. JUMR 2502, September 1998, Salihī. JUSTM 409, 2001, Rihābā. MUM 0075, 9 April 1991, Mamoneyeh. MUM 0399, 14.6.1992, Al Karak.

New localities. As Salt.



Fig. 82. The Black-headed Dwarf Snake, *Rhynchocalamus melanocephalus*, from Salt.

Published records. Petra (HART, 1891; BARBOUR, 1914; SINDACO *et al.*, 1995), Al Jubayhah, Ayl, Basta, Dayr Abū Sa'īd, Jarash (DISI *et al.*, 1988); Azraq (GASPERETTI, 1988), Basta (AMR *et al.*, 1994), Al Karak, Mamoneyeh (EL ORAN *et al.*, 1994), Dibbīn (DAMHOUREYEH *et al.*, 2009).

Materials recorded in other museum. CAS 147592, before December 1977, Azraq, *leg.* F.A. WAZANI. MCZ R-9651, 14 January–31 December 1914, Petra, *leg.* J. C. PHILLIPS & W. M. MANN. MCC/R617, Petra, 1.5.1994, *leg.* R. SINDACO & N. FEDRIGHINI. ZFMK 54054, Petra.

Systematics. This genus includes *Rhynchocalamus melanocephalus melanocephalus* confined to Jordan, Palestine, Syria, Lebanon and northern Saudi Arabia, *Rhynchocalamus melanocephalus satunini* (NIKOLSKY, 1889) distributed in southern Turkey, northern Iraq and Iran and the southern states of the former Soviet Union, and *Rhynchocalamus arabicus* (SCHMIDT, 1933) known only from Aden. *Rhynchocalamus* is considered an oriental genus, where most of the known species occur in the Philippines, India, Sri Lanka, Iran and Baluchistan (HAAS, 1952).

Diagnosis. Body is cylindrical, with small head, not distinct from the neck. Rostral shield large. Loreal either very small or absent. Nasal undivided; internasal trapezoid-shaped and the suture length of this plate is the same as the prefrontal suture. Parietals shorter than the distance from the posterior tip of rostral to the posterior tip of frontal. Temporals 1+1 or 1+2. Seven UL, 3rd and 4th entering the eye. Three or four LL in contact with the anterior chin-shields; posterior chin-shields very small. Dorsal scales smooth in 15 rows at mid-body, VS 179–231, CS 53–70. Maximum total length may reach 46 cm.

Colouration. The top of the head and neck glossy black, upper labials and rostral shield ivory white (Fig. 82). The black nuchal band just reaches the ventral scales. The ground colour of the dorsum is yellowish-brown without maculation while the

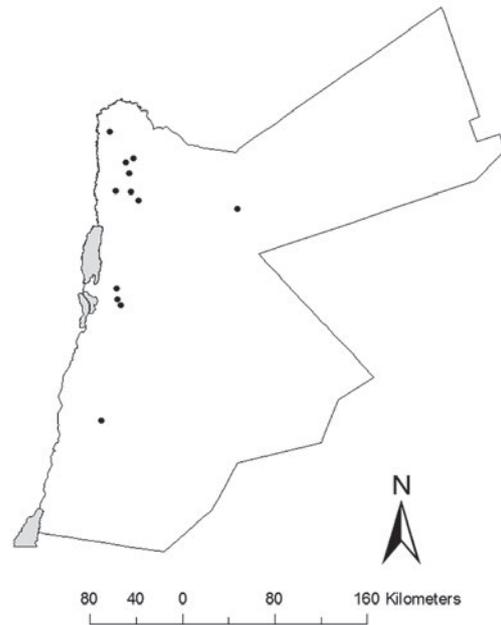


Fig. 83. Distribution of *Rhynchocalamus melanocephalus* in Jordan.

ventral side is yellowish-white without any maculation.

Habitats and ecology. Prefers humid areas and confined to the Mediterranean ecozone. It was collected from wadis with scattered vegetation near Al Karak. This is nocturnal species. Its presence in Azraq may reflect its relictary affinity, as suggested by GASPERETTI (1988), who postulated that *Rhynchocalamus* is a relict of the Pleistocene and the late pluvial in southwestern Asia. In Sinai, BAHA EL DIN (1994) found this snake in open gravel plains with little vegetation. In Turkey, it was found under small stones, in a habitat of loose substrate with sparse vegetation (AVCI *et al.*, 2008).

Biology. DISI *et al.* (2001) stated that the diet of this snake consists of small insects (crickets, locust and ants), centipedes and perhaps small lizards.

Remarks. Both HART (1891), and BARBOUR (1914) collected this species from Petra. Also, FLOWER (1933) indicated several specimens that were brought to Gizza Zoological Garden from Palestine. FRANZEN & BISCHOFF (1995) examined specimens of *R. melanocephalus* from several countries in the Middle East, including Jordan and stated that the two forms (*R. m. melanocephalus* and *R. m. satunini*) show no differences in terms scale counts and morphometric measurements.

Genus *Spalerosophis* JAN, 1865

The most important features for this genus include the following: The orbit is completely encircled by 10–13 ocular scales and the upper labials are never in contact with the oculars, prefrontals and loreals are broken into several small-sized scales, temporals are divided into several scales, and usually the anal plate is undivided (MARX, 1959). The genus *Spalerosophis* includes three species and several “*diadema*” subspecies. The distribution range for species of this genus extends from North Africa, the Sahara, Middle East and the Arabian Peninsula, Iran, Afghanistan, to India (Marx, 1959).

Spalerosophis diadema cliffordii (SCHLEGEL, 1837)

Coluber diadema SCHLEGEL, 1837. – Phys. Serp., 2: p. 163.

Zamenis cliffordii GÜNTHER, 1859. – Catalogue of Colubrine snakes of the British Museum, p. 104.

Zamenis diadema BOULENGER, 1893. – Catalogue of the Snakes in the British Museum (Natural History), 1: p. 410. – ANDERSON, 1898, Zoology of Egypt. Reptilia and Batrachia, 1: p. 267.

Spalerosophis diadema FLOWER, 1933. – Proceedings of the Zoological Society of London, 1933: p. 813. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, 98: p. 291. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 307.

Spalerosophis cliffordii SCHMIDT, 1939. – Field Museum of Natural History, Zoology Series, 24: p. 77. – SCHMIDT & MARX, 1956, Fieldiana Zoology, p. 32.

Spalerosophis diadema cliffordii MARX, 1968. – Special Publication US Naval Medical Research Unit 3, p. 38. – DISI, AMR & DEFOSSE, 1988, The Snake, 20: p. 47. – GASPERETTI, 1988, Fauna of Saudi Arabia, 9: p. 276. – LEVITON, ANDERSON, ADLER & MINTON, 1992, Handbook to the Middle East Amphibians and Reptiles, p. 105.

Common name. Diadem Snake, Clifford’s Snake, Clifford’s Royal Snake, Camel Snake.

Range. North Africa to western Iran, southern Turkey to the Arabian Peninsula.

Distribution in Jordan. Fig. 85.

Material examined (N=28). JUMR 83, 1981, Wādī Fidān. JUMR 468, no date, Dhaba’ah. JUMR 544, 1980, Al Jafr. JUMR 611, 1980, Ar Ramthā. JUMR 662, 5 May 1981, Dhaba’ah. JUMR 668, 5 May 1981, Al Qaṭrānah. JUMR 671, June 1981, Jāwā. JUMR 672, June 1981, Jāwā. JUMR 676, June 1981, Jāwā. JUMR 703, 1981, Ma’an. JUMR 829, 17 November 1981, Wādī Ramm. JUMR 897–898, May 1982, Ar Ramthā. JUMR 906, 22 August 1983, Jāwā. JUMR 1150, 21 August 1982, El Karāma. JUMR 1343, May 1983, Ḥisbān.



Fig. 84. Clifford’s Snake, *Spalerosophis diadema cliffordii*, from Ar Ramthā.

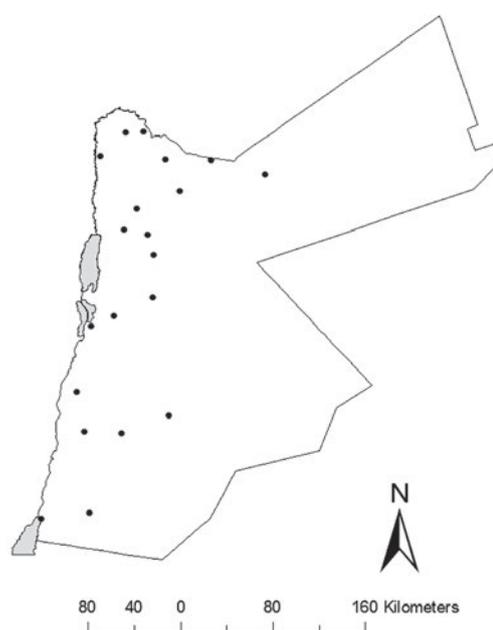


Fig. 85. Distribution of *Spalerosophis diadema cliffordii* in Jordan.

JUMR 1375, May 1983, JUSTM 399, June 1997, al Bustānah Reserve. JUSTM 405, 12 September 2000, Wādī Ramm. JNHM 367, no date, Irbid. JNHM 609, June 1983, Al Mafraq. JNHM 1143, May 1983, Ḥisbān. JNHM 1150, 21 August 1983, El Karāma. MUM 0102, 1 July 1991, Ma’an. MUM 0134–135 & 143, 18 August 1991, Ma’an. MUM 0144, 5 May 1973, Ma’an.

New localities. Qaṣr al Ḥallābāt, Umm al Qiṭṭayn, Wādī Ramm.

Published records. ‘Aqaba -Dead Sea (HART, 1891); W Dhaba’ah (HAAS, 1951); Al Qaṭrānah, Ma’an (AMR *et al.*, 1994; EL ORAN *et al.*, 1994); ‘Ammān, ‘Aqaba, Al Jafr, Al Qaṭrānah, Ar Ramthā, Azraq, Dhaba’ah, El Karāma, Ḥisbān, Shawmarī Wildlife Reserve, Qaṣr al Ḥallābāt, Wādī Fidān, Wādī Ramm (DISI *et al.*, 1988); ‘Aqaba, Wādī Fidān (AL ORAN *et al.*, 1997); Azraq, Shawmarī Wildlife Reserve, Qaṣr Burqu’ (DISI *et al.*, 1999); Safawi (DISI *et al.*, 2001); Al Adnaneyha, Al Jafr, Al Karak, Ghawr aṣ Ṣāfi, Ma’an (LAHONY *et al.*, 2002); Wādī Ramm (ABU BAKER *et al.*, 2004).

Table 20. Scale counts and measurements (mm) for *Spalerosophis diadema cliffordi* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0102	♀	227	75	996	195
MUM0134	♀	236	81	325	66
MUM0135	♂	210	73	327	73
JUMR375	♂	210	82	310	68
JUMR703	♂	207	76	298	77
JUMR829	♂	222	na	602	135

Materials recorded in other museums. CAS 147593, before December 1977, Azraq, leg. F.A. WAZANI. CAS 148626, before December 1977, Azraq, leg. F.A. WAZANI. HUJ-R 3079, W Daba'a (= Dhaba'ah), 65 miles SSE 'Ammān, June 1938. HLMD J62, Wādī Ramm.

Systematics. Species of this genus were discussed by MARX (1959). He stated that four subspecies of *Spalerosophis diadema* are known: *S. d. cliffordi* is distributed from northwestern Africa eastward into the Tigris-Euphrates Valley, with no appreciable differences among these populations, *S. d. dolichospila* with distribution confined to Atlas Mountains of Tunisia and Algeria and the Hoggar Mountains of southern Algeria, *S. d. schiraziana* found in Zagros Mountains of western Iran eastward through southern Turkmenistan and Afghanistan into Pakistan and India and *S. d. diadema* confined to Pakistan and India. Recently, SCHÄTTI *et al.* (2009) provided a key for this genus.

Diagnosis. Aglyphous. Large and robust snake that may reach 130 cm in length. Head is very distinct from neck. Eyes are relatively large with round pupils. Rostral as deep as broad or a little broader than deep, visible from above. Prefrontals usually broken up into several shields, there being frequently three transverse series of shields between the rostral and the frontal. Temporals small and numerous, scale-like. Three to five loreals. Two to four PO and 3–4 PtO. Frontal one and one fourth to one and a half as long as broad, as long as or slightly shorter than its distance from the end of the snout, and usually shorter than the parietals. 10–13 UL, none is in contact with the eye. Five LL in contact with the anterior chin shields, which are nearly as long as the posterior. A series of suboculars separate the upper labials from the eye. Scale rows consists of 25–29 scales, VS 205–254, CS 64–82. Table 20 shows scale counts and body measurements for *S. d. cliffordii*.

Colouration. The background colouration of the head and body varies but is usually grayish, yellowish, sandy-beige or reddish. Dorsum covered with large dark to light brown spots with white scales

around the borders (Fig. 79). Alternate smaller spots on flanks. Head markings, consisting of a dark band, which runs across the head between the eyes, behind which several irregular, dark spots may be present.

Habitats and ecology. Reported earlier from desert habitats (DISI *et al.*, 1988). HART (1891) indicated the presence of this species from Aqaba to the Dead Sea. *S. d. cliffordi* is a thermophilous species and more common in the arid regions of Jordan. It is common near agricultural areas in Saudi Arabia (GASPERETTI, 1988). They feed on rodents such as mice and rats. A specimen was recovered from a burrow of the Sand Rat, *Psammomys obesus*, at Qaşr al Ḥallābāt. *Spalerosophis diadema cliffordi* is active during daytime in winter and at night in summer. This is probably an adaptation in its feeding behavior to minimize water loss and exposure to the hot and cold temperatures of desert habitats. WERNER (1970) studied the adaption of the eye of this snake to diurnal and nocturnal activity. He found the area of the circular pupil when dark is adapted 17–21 times greater than when adapted to 67,500 lx, which is much higher in other four colubrids with rounded pupils.

Biology. The authors recovered 13 eggs from a specimen examined at the Jordan University Museum. It feeds on *Passer domesticus* and *Jaculus jaculus* (AMR & DISI, 1998). In captivity, it feeds on various animals including laboratory and wild mice, lizards, however, it refused frogs and toads. Feeding is achieved by striking the prey and holding it by the mouth, then coiling itself around it until it suffocates. Later, it will seize the prey in a corner and start to swallow it by orienting the prey's head towards its mouth. This is an aggressive snake and produces a loud hissing when provoked.

In captivity, oviposition takes place mainly in July and August, with the number of eggs per clutch varying from 3 to 16, depending on the size of the female (DM'EL, 1967). The eggs increase in weight by absorbing contact water from the substrate. Growth rates of females in each age-group are higher than those of males.

Remarks. This species requires more elaboration in terms of the scattered populations in Jordan and its range of distribution. Perhaps molecular evidences can reveal the sub-specific status of this snake in the Middle East.

Genus *Telescopus* WAGLER, 1830

Opisthoglyphous. The head is ovoid and noticeably distinct from the neck. Eyes with elliptical pupils. Maxillary teeth 10 to 12, anterior longest, gradually decreasing in size posteriorly, and followed, after an interspace, by a pair of enlarged, grooved fangs, situated below the posterior border of the eye; anterior mandibular teeth strongly enlarged. Body cylindrical or slightly compressed; scales smooth, oblique, with apical pits; ventrals rounded. Mid-body scales in 19–25 rows. Tail moderate; subcaudals in two rows.

This genus includes ten species distributed in southwest Asia, southeastern Europe, northeastern, tropical and southern Africa (GASPERETTI, 1988). The taxonomic status for species of this genus are by far the most complicated among the colubrid snakes in the Middle East and requires in-depth revision.

Telescopus dhara (Forskål, 1775)

Coluber dhara FORSKÅL, 1775. – Mus. Senckenb., 1: p. 137.

Tarbophis obtusus BOULENGER, 1896. – Catalogue of the Snakes in the British Museum (Natural History), 3: p. 52. – ANDERSON, 1898, Zoology of Egypt, Reptilia and Batrachia, I: p. 283

Telescopus dhara dhara GASPERETTI, 1988. – Fauna of Saudi Arabia, 9: p. 278. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, 98: p. 292.

Telescopus dhara GRUBER, 1989. – Die Schlangen Europas und rund ums Mittelmeer, p. 160. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 309. – BAHA EL DIN, 2006, A Guide to the Reptiles and Amphibians of Egypt, p. 272.

Common name. North-African Cat Snake, the Tree-cat Snake.

Range. Egypt, Palestine, Jordan, the Arabian Peninsula.

Distribution in Jordan. Fig. 87.

Material examined (N=4). JUMR 1083, September 1982, Wādī Fidān. JUMR 1720, 1986, Wādī ‘Araba. JUMR 1877, June 1987, Wādī Fidān. JUMR 2019, 1991, El Karāma.

New localities. Ash Shawbak, Ghawr aş Şāfī, Ḥumrat Mā‘īn and Wādī Al Mujīb.



Fig. 86. The North-African Cat Snake, *Telescopus dhara*, from Wādī Al Mujīb (N. HAMDAN).

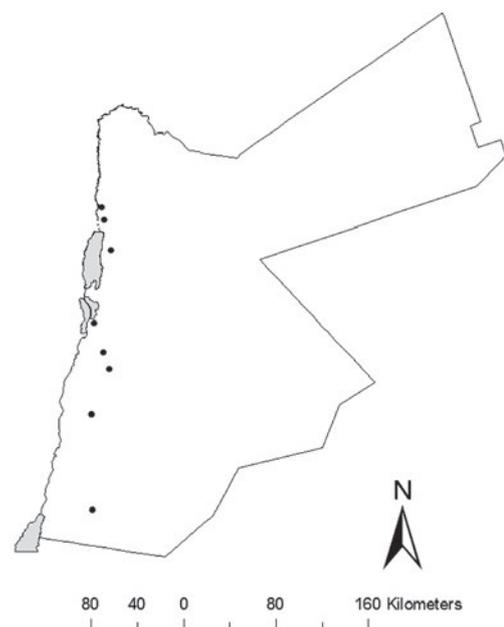


Fig. 87. Distribution of *Telescopus dhara* in Jordan.

Published records. El Karāma, Wādī Fidān, Wādī ‘Araba (DISI, 1993), Wādī Ramm (ABU BAKER *et al.*, 2004), Al-Hisha al-Beda, Petra (DISI *et al.*, 2001).

Materials recorded in other museums. HUI-R 8300, Dayr ‘Allā, 30 May 1961, *leg.* East Ghor Canal Authority.

Systematics. The Tree Cat Snake is a polytypic species with two subspecies occurring within its large range of distribution. *T. d. dhara* is confined to the eastern Mediterranean and Arabia, while *T. d. obtusus* is distributed in North Africa.

Diagnosis. Head distinct from neck with a short broad and rounded snout. Loreal is twice as long as deep. One preocular, two postoculars. Temporals 2+2 or 2+3. 9/9 UL, usually the 3rd, 4th and the 5th entering the eye. 10/10–11/12 LL. MBS 21–23 with apical pits, VS 235–274, CS 61–79. SV 59–82, T 12–14.5 mm. Maximum length may reach up to 105 cm.

Colouration. Head is speckled with dark brown spots. Red bands separated by narrow streaks on the dorsal side. Two rows of red-brown spots alternate with dorsal bands (Fig. 86). One specimen was uniformly light red, with diminished streaks.

Habitats and ecology. This snake is usually an inhabitant of hamada areas and rocky hills. Males are noticeably shorter than females, 48 and 82 cm respectively. Females live on bushes and trees. They remain hanging motionless on tree branches and feed mainly on birds, however, young females feed on lizards. In contrast, males are strictly ground inhabitants (ZINNER, 1985). Specimens collected from Wādī Ramm were caught at night.

Biology. DISI (1993) and AMR & DISI (1998) recovered a house sparrow, *Passer domesticus*, and an avian egg from two specimens collected from Wādī Fidan. Small chameleon and a small passerine were recovered from specimens collected from Dhofar, Oman (ARNOLD, 1980). A specimen collected from Wādī Al Mujib remained trapped on a cliff for over a month. It was lifted by water during flooding and remained motionless for an extended period of time before it was translocated.

Remarks. DISI (1985) assigned specimens collected from Petra as *T. fallax* based on low number of upper labials. GASPERETTI (1988) argued on the validity of these specimens and considered them as *T. dhara* based on the scale counts that falls within the range of *T. dhara* and considered ventral colouration reported as morphs of this snake. DISI *et al.* (2001) reconsidered this record again and assign it to *T. hoogstraali*.

Telescopus hoogstraali SCHMIDT & MARX, 1956

Telescopus fallax hoogstraali SCHMIDT & MARX, 1956. – Fieldiana Zoology, **39**: p. 33, figs. 5–6.

Telescopus hoogstraali DISI, MODRÝ, NEČAS & REFAI, 2001. – Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 313. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 294.

Common name. Sinai Cat Snake.

Range. Sinai, Palestine and southern Jordan.

Distribution in Jordan. Fig. 89.

Material examined (N=1). MUM_0064, 11 June 1991, Ash Shawbak.

Published records. Petra, Wādī Ḍānā (DISI *et al.*, 2001).



Fig. 88. The Black Cat Snake, *Telescopus hoogstraali*, from Ḍānā Nature Reserve (D. MODRÝ).

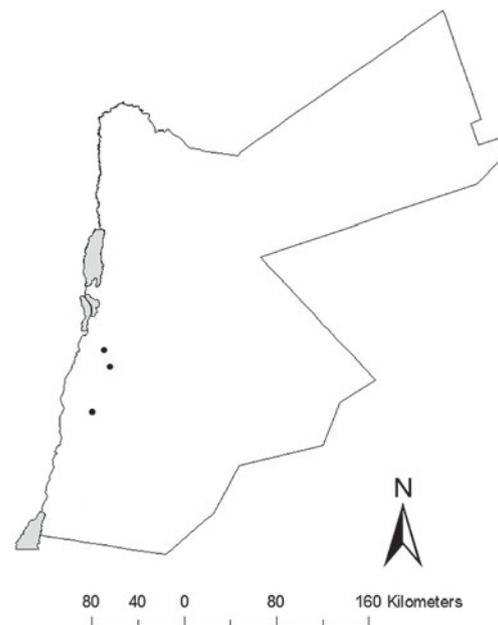


Fig. 89. Distribution of *Telescopus hoogstraali* in Jordan.

Systematics. This species was originally described by SCHMIDT & MARX (1956) from Wadi el Sheikh, near St. Catherine’s Monastery, Sinai. Transitional specimens collected in the Negev Desert showed a gradual change in the number of the dorsal bands from low numbers in the north to high numbers in the south. Based on these transitional specimens ZINNER (1977) placed *Telescopus hoogstraali* as a subspecies of *Telescopus fallax*, although WERNER (1988) considered the evidence inconclusive.

Diagnosis. Body stout, tail slender. Head broad in temporal region. Eye relatively small, less than its distance from the mouth. Rostral scarcely visible from

above. Internasals smaller than prefrontals. Frontal subtriangular, the anterior angles truncate at their contact with the preoculars, as long as its distance from tip of snout. Parietals about as long as the distance from their anterior borders to tip of snout. Nasal rectangular, semi-divided. Loreal elongate, entering eye below preocular. One PO; two PtO. Temporals two to four on each side. Nine UL, 3rd, 4th, and 5th entering the eye. Nine LL. Dorsal scale rows 19, smooth, slightly oblique; VS 242–254, CS 46–56 scales. Anal divided. Maximum length may reach up to 100 cm.

Colouration. Belly grey, with densely spread fine black spots, lighter laterally and darker medially. Head grey, vermiculated with black; neck dorsally black. Body colour light grey-brown, with narrow dorsal spots, either vanishing or forming transverse bars; 28–47 crossbars (Fig. 88).

Habitats and ecology. Based on its distribution, the Sinai Cat Snake seems to be restricted to the Mediterranean biotope of southern Jordan. All localities are either densely or scarcely forested areas with mild climate. In Džanā Nature Reserve, it was collected from sand-stone cliffs (DISI *et al.*, 2001). In Sinai, it was collected from lightly vegetated hilly and mountainous regions among rocks (BAHA EL DIN, 2006).

Biology. This is a nocturnal species and feeds on small lizards such as *Trapellus ruderatus* (DISI *et al.*, 2001). Defensive behavior of this snake was described by DISI *et al.* (2001), where it coils its body, with an S-curved cranial part of the body, then hisses and final strikes.

Remarks. EL-ORAN *et al.* (1994) considered one specimen (MUM 0064) collected from Ash Shawbak as *T. nigriceps*. This specimen has 237 ventral scales and 35 crossbars. This specimen is considered now as *T. hoogstraali*.

Telescopus nigriceps (AHL, 1924)

Tarbophis nigriceps AHL, 1924. – Archiv für Naturgeschichte, **90** (A): p. 246. – SCHMIDT, 1939. Field Museum of Natural History, Zoology Series, **24**: p. 84.

Telescopus fallax nigriceps LEVITON, ANDERSON, ADLER & MINTON, 1992. – Handbook to the Middle East Amphibians and Reptiles, p. 107.

Telescopus nigriceps DISI, AMR & DEFOSSE, 1988. – The Snake, **20**: p. 48. – DISI, MODRÝ, NEČAS & REFAL, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 315. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 295.



Fig. 90. The Black-headed Cat Snake, *Telescopus nigriceps*, from Jarash.

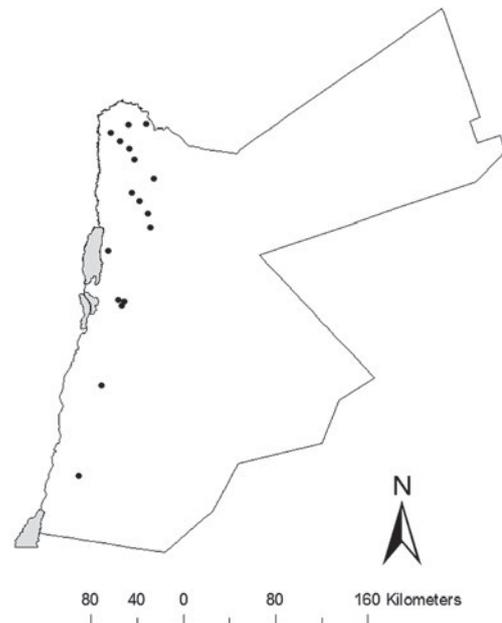


Fig. 91. Distribution of *Telescopus nigriceps* in Jordan.

Common name. Black-headed Cat Snake (proposed).

Range. Jordan, Palestine, Syria, Lebanon and Turkey.

Distribution in Jordan. Fig. 91.

Material examined (N=25). JUMR 137, 13 April 1982, Şakrah. JUMR 353, no date, ‘Ammān. JUMR 884, April 1982, Ar Ramthā. JUMR 924, 23 June 1982, Al Jubayhah. JUMR 1254, April 1983, Mekawer. JUMR 1345, April 1983, Şahāb. JUMR 1353, May 1983, Ar Ramthā. JUMR 1377, 21 April 1979, Al Jubayhah. JUMR 1400, May 1983, Dayr Abū Sa‘īd. JUMR 1478–1482, 11 August 1983, Al Fujayj. JUMR 1486, 11 August 1983, Al Fujayj. JUMR 1484, 11 August 1983, Al Fujayj. JUMR 1488, 11 August 1983, Al Fujayj. JNHM 137, 6 March 1982, Irbid. JNHM 508, 11 April 1983, Irbid. JNHM 700, 25 September 1983, Sukhna. MUM 0094, 11 July 1991, El Quweira. MUM 0369, 15 September 1992, Al Karak. MUM

Table 21. Scale counts and measurements (mm) for *Telescopus nigriceps* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0094	na	na	na	206	33
MUM0369	♀	190	46	365	59
MUM0431	♀	193	57	312	62
MUM0438	♂	181	52	290	62
MUM0500	♂	183	47	236	33

0431, 3 April 1993, Zahum. MUM 0438, 20 April 1993, Zahum. MUM 0500, 9 April 1991, Mamoneyeh.

New localities. Al Hummar, Birqish, Jarash.

Distribution in Jordan. 10 km S 'Ammān (HAAS, 1943), Deheibe el Gharbiye (AMR & SALIBA, 1987), 'Ammān (DISI *et al.*, 1988), Al Karak, Ash Shawbak, El Quweira, Mamoneyeh, Zahum (EL-ORAN *et al.*, 1994).

Materials recorded in other museums. BM 1927.8.16.7, Ammān. HUI-R 3108, 10 km S of Ammān, 26 March 1936, leg. G. HAAS. ZFMK 44381, Ash Shawbak, (Listed as *Telescopus fallax syriacus*).

Systematics. LEVITON *et al.* (1992) assigned *T. nigriceps* as a subspecies of *fallax*, however, MARTENS (1993) disputed their treatment for its insufficient explanation, and considered the *T. nigriceps* as a good species, and indicated that it occurs sympatrically with *T. fallax syriacus*. Furthermore, as indicated by MARTENS (1993), *T. nigriceps* can be distinguished from sister taxa by its low ventral counts and colour patterns.

Diagnosis. Head flat and relatively large, slightly distinct from neck. Eyes with vertical pupils. VS 172–196; CS 39–58; 15–29 crossbars. Maximum length may reach up to 60 cm. Table 21 indicates scale counts and body measurements for *Telescopus nigriceps*.

Colouration. Belly black; head black to dark grey with black and light grey mottles (Fig. 85).

Habitats and ecology. This snake was collected from Mediterranean and mesic habitats within the Irano-Turanian biotopes. Individuals were seen and collected from pine-forested regions in Jarash and from around the fringes of the *terra rosa* soil and hard soil near Al Muwaqqar. The Black-headed Cat Snake was found to inhabit deserted rodent burrows constructed under *Anabasis articulata* bushes. Steppe habitats with low shrubs and rocky terrain near Ash Shawbak yielded several specimens. MARTENS (1993) found specimens among basalt boulder fields in southern Syria. This snake is strictly nocturnal with peak activity after sunset (DISI *et al.*, 2001).

Biology. This is a nocturnal snake. It feeds on lizards, bird eggs and small mammals (DISI *et al.*, 2001). In captivity, the xeric inhabitant form of *T. nigriceps* accepted suckling mice, while the mesic inhabitant preferred lizards (DISI *et al.*, 2001). Defensive behavior of this snake was described by DISI *et al.* (2001), where it coiled itself, with its one third of its body highly elevated showing S-curved front, flattened and backwards widened head.

Remarks. DISI *et al.* (2001) considered that *T. nigriceps* in Jordan has two forms; the true or typical form "*T. nigriceps*" and the form "*T. cf. nigriceps*". The first form is found in flat desert areas at low elevations, while the latter form is known from mountainous areas at high elevation. GÖÇMEN *et al.* (2007) provided excellent comparison between *T. nigriceps* and *T. fallax syriacus*.

Family Atractaspididae GÜNTHER, 1858

Atractaspididae or the Mole Viper family is related to elapids. Externally, they are similar in appearance to colubrid snakes, however, species of this family are characterized by possessing powerful erectile hollow front fangs. The fangs are erected rather laterally. Species of this family are strictly fossorial and known as the burrowing asps or mole vipers. This family includes two genera known to occur in Jordan, *Atractaspis* and *Micrelaps*.

Key to species of the genera of family Atractaspididae

- 1 Dorsal pattern uniformly dark; 25–29 scale rows at midbody *Atractaspis engaddensis*
– Dorsal pattern made by dark and whitish rings,

- the dark rings larger; belly and upper part of head dark; 15 scale rows at midbody *Micrelaps 2*
- 2 Crossbars are complete and in touch with the ventral scale, crossbars wide never exceeds 45 *Micrelaps muelleri*
- Crossbars are not in touch with the ventrals, forming a saddle-like, crossbars narrow reaching up to 58 *Micrelaps tchernovi*

Genus *Atractaspis* SMITH, 1849

Head relatively small and not marked from the neck and with large symmetrical shields on top of head. The nostril positioned between two nasals; absence of loreal; round pupils in small eyes; absence of post-frontal bone. Dorsal scales smooth; ventrals rounded: anal undivided. Erectile hollow fangs on maxillary (GASPERETTI, 1988; LEVITON *et al.*, 1992; UNDERWOOD & KOCHVA, 1993; KOCHVA, 2002). The biting apparatus of *Atractaspis* is unique through the linking between prefrontal and maxillary bone, which allows for a firm rotation of the maxillary with the fang during the one-sided, closed mouth strike. The genus *Atractaspis* is known from southern and tropical Africa, western Arabia, Sinai, southern Jordan and Palestine. About 14 species have been described, of which one species (*Atractaspis engaddensis*) is known to occur in Jordan.

Atractaspis engaddensis HAAS, 1950

- Atractaspis engaddensis* HAAS, 1950. – Copeia, **1950**: p. 52.
- Atractaspis microlepidota engaddensis* GASPERETTI, 1988. – Fauna of Saudi Arabia, **9**: p. 284. – AL ORAN & AMR, 1995. Zoology in the Middle East, **11**: p. 47. – EGAN, 2007, Snakes of Arabia: A Field Guide to the Snakes of the Arabian Peninsula and its Shores, p. 131.
- Atractaspis engaddensis* DISI, AMR & DEFOSSE, 1988. – The Snake, **20**: p. 48. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 319. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 297.

Common name. En Gedi Mole Viper, Palestinian Mole Viper.

Range. Southern Jordan, lower Jordan Valley and Palestine.

Distribution in Jordan. Fig. 93.

Material examined (N=1). IUSTM 392, 11 July 1996, Wadi Shigig.



Fig. 92. The Palestinian Mole Viper, *Atractaspis engaddensis*, from Al Mujib Nature Reserve.

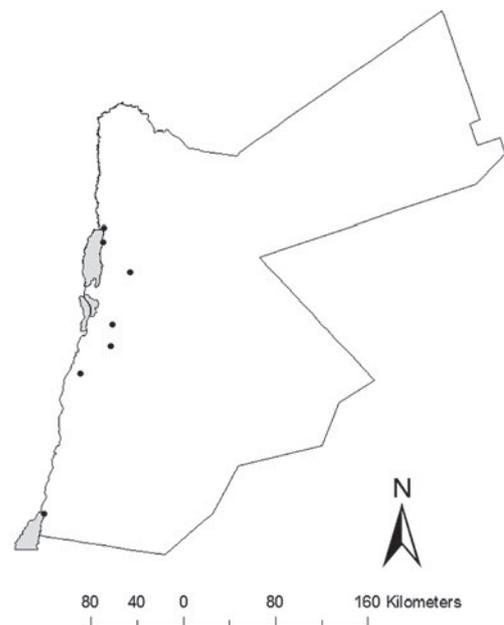


Fig. 93. Distribution of *Atractaspis engaddensis* in Jordan.

Published records. Al La‘bān area (20 km N Aṭ Ṭafīla), Wādī Al-Hussyneh (35 km N of Aṭ Ṭafīla) (AL-ORAN & AMR, 1995).

New localities. ‘Aqaba, Wādī Faynān, Wādī Al Mujib NR, NE shores of the Dead Sea.

Systematics. This species was originally described by HAAS (1950) from Ein Geddi, near the Dead Sea. According to KOCHVA (1998) *A. microlepidota andersoni* nearly reaches the Jordanian border in north-western Saudi Arabia. ARNOLD (1980) suggested that *A. engaddensis* possibly intergrades with *A. m. andersoni*. This could mean that both are subspecies of *microlepidota*. GASPERETTI (1988) reports a distributional overlap of both forms in south-western Saudi Arabia. If this holds true, *A. engaddensis* could well be a separate species, as Israeli authors (e.g. WERNER 1995) continue to believe. They also show differences

in venom action (KOCHVA, 1998). Therefore the alternative of synonymizing *engaddensis* with *andersonii*, preferred by LEVITON *et al.* (1992) and SCHÄTTI & GASPERETTI (1994) seems less supported.

Diagnosis. Snout very short and moderately pointed. Frontal large and longer than broad; width of frontal equals length of parietal. One supraocular; one preocular and one postocular. 2+3 scale-like temporal. Six upper labials, the 3rd and 4th enter the eye. Ten lower labials; three or four in contact with the anterior chin shields. Lower jaw is retracted than the upper jaw and the mouth opening is located ventrally. Nasal divided in its lower half. Ten scales between chin shields and first ventral scales. 23–29 smooth midorsal scales, VS 263–282; 31–39 entire CS. Anal undivided. SV Length reaches 700 mm or more, tail length reaches 60 mm. Maximum total length may reach up to 80 cm.

Colouration. Dorsally it is usually shiny black. Rarely it is uniformly dark, shiny brown or gray. Ventrals are an iridescent light colour (Fig. 92).

Habitats and ecology. This is a strictly fossorial snake, that seldom emerges above ground. However, it seems to move at night, this behavior was observed in the Wādī Al Mujib area, where an adult specimen was seen at night moving on the ground along small rocks. Subterranean in vegetated places in hot and humid areas. Sometimes found in gardens while digging or under stones. It prefers loose soil and avoids loose sand or very arid situations. Also, it prefers oases or farms and may be encountered on arid hillsides (Al Mujib Wildlife Reserve). Two specimens were collected from Aṭ Ṭāfila Governorate; Al La'bān (20 km N Aṭ Ṭāfila) and Wādī Al Hussynehye (35 km N. At Aṭ Ṭāfila) with scattered vegetation including *Arundo donax*, *Ziziphus lotus*, *Retama raetam*, *Salso-la vermiculata* and *Nerium oleander*, also and a few olive and grape grooves (AL ORAN & AMR, 1995).

Biology. KOCHVA & GOLANI (1993) and GOLANI & KOCHVA (1988) reported on tail display and other offensive and defensive postures of this mole viper. They stated that when in a threatening posture, the snake presses its head to the ground while arching its neck and coiling the body so that the head is covered by the body coils. Mating takes its place in June. Females lay 2–3 eggs during September–November and they take more than three months to hatch (KOCHVA, 1989). It may feed on young rodents, leptotyphlopids, amphisbaenids, lizards and some other snakes (PITMAN, 1974). Also, the diet of this snake includes passerine (three birds were found in one snake), the Three-toed Jerboa (*Jaculus jaculus*) and

other unidentified rodents. WERNER (1985) reported that this species feeds on other snakes.

The sharp projections of the fangs may be related with the special striking behavior of *Atractaspis*. This projection helps ensure that the tiny amount of the venom is fully penetrated in to the prey (KOCHVA & MEIER, 1986). *Atractaspis* species exhibit an unmatched structure of venom glands with specific osteological and mycological modifications (KOCHVA *et al.*, 1967).

Remarks. In an earlier paper, AL-ORAN & AMR (1995) considered *Atractaspis engaddensis* that occurs in Jordan as *Atractaspis microlepidota engaddensis*, based on the discussion proposed by GASPERETTI (1988). Upon further discussions (Dr. ULRICH JOGER, personal communication), the authors are inclined to consider that *Atractaspis microlepidota* and *Atractaspis engaddensis* are two separate species, and their sympatric occurrence in Arabia does not warrant considering both species as two subspecies. The record “Lebanon” by HARDING & WELCH (1980) is certainly wrong, as the mole vipers are tropical snakes, whereas the Lebanon is entirely Palaearctic.

Genus *Micrelaps* BOETTGER, 1880

Opisthoglyphus, a single hollow tooth in the posterior supramaxilla above the sutures of the 4th and 5th upper labials; only two simple teeth separated by a large interspace at front of upper jaw; teeth increase in sizes backwards Rounded pupils in small eyes. Nasal opening pierced in center of single nasal; loreal and preocular absent; postfrontals reach the 3rd upper labial: postocular small; 1+2 temporals. Fifteen rows of smooth scales at midbody. Anal and subcaudals divided. BISCHOFF & SCHMIDTLER (1997) included *Micrelaps muelleri* with family Atractaspididae. However, in the original description of *Micrelaps muelleri* BOETTGER 1880 indicated that it is similar in character to *Elapomorphus* WIEGM, but with very few simple teeth in the anterior and a single grooved major tooth in the posterior supramaxilla. Dentition is opisthoglyphous. Only two strong simple teeth separated by a large interspace are present in the upper jaw on both sides at the front. There is a single, strong, slightly curved, deeply furrowed tooth posteriorly above the sutures of the 4th and 5th upper labials. The size of the teeth of the upper jaw increases backwards, in a ratio of 1:2:3. Moreover, as in the genus *Elapomorphus*, the eye is obviously small; the nasal opening pierces the middle of the single nasal shield and the loreal is absent. Different from the ge-

nus *Elapomorphus*, *Micrelaps* has no preocular and the postfrontals on both sides touche the margin of the third upper labials. Seven upper labials and seven lower labials five of which are touching two pairs of equal-sized submentals. Anal and subcaudals are divided (AMR *et al.*, 1997b). In the Middle East, this genus is represented by two species, *Micrelaps muelleri* and *Micrelaps tchernovi* (WERNER *et al.*, 2006).

Micrelaps muelleri BOETTGER, 1880

Micrelaps mülleri BOETTGER, 1880. – Ber. Senck. naturf. Ges., **1879–1880**: p. 137–138, pi. iii/2. – LORTET, 1883. Arch. Mus. Hist. Nat Lyon, p. 184, pi. xix/2.

Micrelaps muelleri BOULENGER, 1896. – Catalogue of the Snakes in the British Museum (Natural History), **3**: p. 48. – HAAS, 1951, Bulletin of the Research Council of Israel, **1**: p. 89. – HAAS, 1952, İstanbul Üniversitesi Fen Fakültesi Mecmuası, Ser. B, **17**: p. 101. – WELCH, 1983, Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphisbaenia, Sauria and Serpentes, p. 64. – DISI, 1985, The Snake, **17**: p. 39. – DISI, AMR & DEFOSSE, 1988, The Snake, **20**: p. 48. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 165. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 321. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 297.

Micrelaps mulleri (sic!) BATTERSBY, 1953. – Annals and Magazine of Natural History **6**: p. 640.

Common name. Mueller’s Ground Viper.

Range. Jordan, Palestine Lebanon northwards to northern Syria.

Distribution in Jordan. Fig. 95.

Material examined (N=8). JUMR 917, May 1982, Zabdah. JUMR 2046, no date, Salihī. JNHM 229, 8. May 1982, Ash Shūnah ash Shamāliyah. JNHM 319, 15 July 1982, NE Jarash. JNHM 917, 4 January 1982, Zabdah. JUSTM 0138, 12 July 1992, Ḥartā. JUSTM 0188, March 1994, Zabdah. JUSTM 0189, 2 May 1994, Irbid.

New localities. Birqish, Zaḥar.

Previous records. NE Jarash, Irbid (DISI *et al.*, 1988), Ash Shūnah ash Shamāliyah, Ḥartā, Salihī, Zabdah (AMR *et al.*, 1997).

Systematics. WERNER *et al.* (2006) distinguished two species of the genus *Micrelaps*; *M. muelleri* and *M. tchernovi*. *M. tchernovi* was found in the Irano-Turanian zone in the central Jordan Valley, while *M. muelleri* inhabits the mesic Mediterranean zone.

Diagnosis. The rostrum is elapid-like, head is compressed, hardly recognizable from the rest of the uni-



Fig. 94. Mueller’s Ground Viper, *Micrelaps muelleri*, from Birqish.

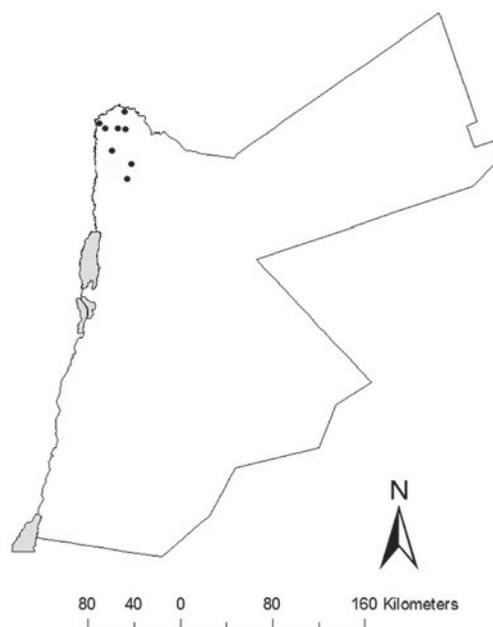


Fig. 95. Distribution of *Micrelaps muelleri* in Jordan.

formly broad body. The venter is flat; the tail is prominently short and broad and at the back, narrowing abruptly into a blunt tip. Rostrals are bulgy, extending over the mouth opening and from above extending a little between the prefrontals. Prefrontals are much narrower and a bit shorter than the postfrontals. Frontals small, hexagonal, half as long as the parietals, at front with obtuse angle, and at back with acute angle. Parietals are large. Temporals often not touching the postocular, in which the 5th UL with the parietal in-between forms a suture. Supraorbital quadrate, nearly as broad as long. From the seven UL, the 3rd and 4th enter the eye (in one specimen only the fourth); 3, 4 and 5 are the largest. Seven LL, the 5th very large. One PtO, 1 + 2 temporals. Scales without apical keels, smooth and rhomboid in shape. Scale rows around the body ranged from 14–15; 34–49, and 3–7 bands across the body and tail respectively. Maximum length may reach up to 52 cm.

Colouration. The upper side is white or slightly pinkish (in life probably dark pink), with 34 (up to 45) irregular dark-brown to black semi-rings occupying 5–6 rows of scales, while the lighter bands occupy 2–3 scale rows (Fig. 94). In young specimens, the dark crossbars are nearly three times as broad as the light bands. The first band of the neck and the first and often the second tail bands form closed light rings. The head from above is very dark; the ventral side is very dark brown, each ventral scale having a broad white posterior edge.

Habitats and ecology. HAAS (1952) stated that Mueller's Ground Viper is a nocturnal, fossorial and rather sluggish snake. Specimens collected from Jordan are within both the Mediterranean and the Irano-Turanian biotopes. Most of the collected specimens are within the Mediterranean biotope characterized by mild summer and cold winter. The soil is typically *terra rosa* with scattered rocky areas. Most specimens were collected during March–July. Two specimens from the Irbid area were found under hay piles near wheat fields during the day-time. One other specimen was taken from the Kurayyimah area, located in the upper part of the Jordan Valley. This is an agricultural area known for its high temperature and humidity, and is dominated by the Irano-Turanian biotope. Another specimen was caught by DAVID MODRY near the King Talal Dam (in the vicinity of Jarash). *Micrelaps muelleri* is a rare species, perhaps due to its fossorial lifestyle.

Biology. Virtually no information is available on the biology of this little known snake. The authors examined stomach contents of five specimens, but no food remains were recovered. HOEVERS & JOHNSON (1982) reported *Micrelaps boettgeri* feeds on *Typhlops* sp. in Somaliland. Mueller's Snake fed on *Abelpharus kitaibelii* in captivity.

Remarks. It seems that the distribution of this species is confined to the northern region of Syria and extends southwards to the mountains of Jordan and Palestine. The distribution of this little known species runs along the Great Rift Valley, that extends from southern Jordan into the Orontes basin further north to the Turkish frontier near Lattakia. BATTERSBY (1953) noted that both Syrian localities of *M. muelleri* are within low-lying coastal regions and it does not occur on the coastal plains in the southern part of its distribution range. HAAS (1951) stated that this species is restricted to the Mediterranean biotope and can endure low temperatures. Furthermore, HAAS (1951) refers an African affinity of this species that penetrated into our area during warm and wet climatic conditions that prevailed at a certain period.

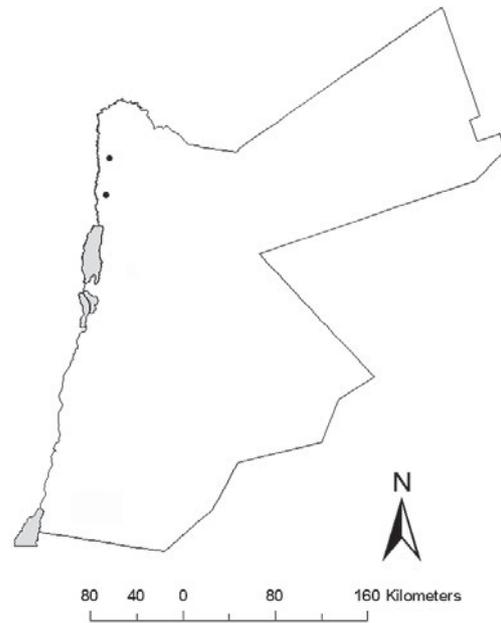


Fig. 96. Distribution of *Micrelaps tchernovi* in Jordan.

Apparently, *M. muelleri* is a relict species of an Ethiopian origin. DISI (1987) suggested that *M. muelleri* may spread from the Jordan Valley into the Mediterranean biotope through the extensive wadi systems branching from the valley to the eastern mountains.

***Micrelaps tchernovi* WERNER, BABOCSAY, CARMELY & THUNA, 2006**

Micrelaps tchernovi WERNER, BABOCSAY, CARMELY & THUNA, 2006. – Zoology in the Middle East, 38: p. 40.

Common name. Tchernov's Chainling

Range. Jordan and Palestine.

Distribution in Jordan. Fig. 96.

Material examined (N=1). JUMR 2055, April 1996, Kuraymah.

Published records. Kureiyima (= Kuraymah), Wādī Rayan (= Wādī al Yābis) (WERNER *et al.*, 2006).

Systematics. WERNER *et al.* (2006) studied museum specimens of *M. muelleri* from the region, including specimens from the Jordan University Museum and the Jordan University of Science & Technology Museum. They conducted principal coordinate analysis and found that *M. tchernovi* is a distinct species.

Diagnosis. The black crossbars fail to reach the ventrals, forming a saddle-like shape. Also, it has a higher number of crossbars than *M. muelleri* that are

relatively narrow reaching up to 58. Ventral scales are uniformly black throughout most of the body and tail.

Colouration. This species was described mostly on colour differences as compared to *M. muelleri* as noted above.

Habitats and ecology. This species is known from localities within the upper Jordan Valley. This area is considered as part of the Irano-Turanian biotope.

Biology. No data are available on the biology of this snake.

Remarks. Specimen JUMR 2055 was considered as *M. muelleri* by AMR *et al.* (1997b). WERNER *et al.* (2006) re-examined this specimen and assigned it *M. tchernovi*.

Family Elapidae BOIE, 1827

This family consists of about 100 venomous species, including the cobras. Members of this family are equipped with an anterior pair of grooved rigid fangs located on a fixed maxillary. Beyond the fangs none or a few teeth may present; fangs almost entirely tubular; proteroglyphous, with well developed venom apparatus. Most species do not possess a loreal; oviparous. In Jordan, this family is represented by one genus (*Walterinnesia*) and one species (*Walterinnesia aegyptia*).

Genus *Walterinnesia* LATASTE, 1887

This is a monotypic genus, *Walterinnesia aegyptia*. Maxilla has only one pair of hollow fangs situated on the anterior part of the maxilla. The head is covered by nine large symmetrical plates, and slightly it is distinct from neck. Eyes are rather small with rounded pupils. Loreal is absent, and the nostril lies in between two to three nasals. Tail is short with the first two to nine subcaudals paired, the rest being entire to the tip of the tail. The Black Desert Cobra, *Walterinnesia aegyptia*, occurs in Egypt, west of the Nile, and southwest Asia.



Fig. 97. The Black Desert Cobra, *Walterinnesia aegyptia*, from El 'Aina (D. MODRÝ).

Walterinnesia aegyptia LATASTE, 1887

Walterinnesia aegyptia LATASTE, 1887. – Le Naturaliste, **1887**: p. 411. – DISI, AMR & DEFOSSE, 1988, The Snake, **20**: p. 49. – GRUBER, 1989, Die Schlangen Europas und rund ums Mittelmeer, p. 166. – LEVITON, ANDERSON, ADLER & MINTON, 1992, Handbook to the Middle East Amphibians and Reptiles, p. 110. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 325. – BAHA EL DIN, 2006, A Guide to the reptiles and Amphibians of Egypt, p. 282. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale "G. Doria", Genova, **98**: p. 298. – EGAN, 2007, Snakes of Arabia: A Field Guide to the Snakes of the Arabian Peninsula and its Shores, p. 138.

Walterinnesia aegypti [sic!] HAAS, 1957. – Proceedings of the California Academy of Sciences, **29**: p. 81.

Common name. Black Desert Cobra, Walter Innes's Snake, Innes' Cobra.

Range. Egypt, Jordan, Palestine, Syria and Arabia.

Distribution in Jordan. Fig. 98.

Material examined (N=7). JUMR 936, 12 July 1982, Jiraish. JUMR 1002, 4 September 1982, between Raḥmah and 'Aqaba. JUMR 1499, 12 October 1983, Azraq. JUMR ?? September 1983, Shawmaṛī Wildlife Reserve. MUM 0407, 9 June 1992, Mu'tah. MUM 0502, 24 June 1992, Al Karak. JUSTRM 396, 16 July 1997, Beqaweyeh.

New localities. Al 'Adasīyah, Al Karak, Azraq, Jāwá, Petra, Qaṣr al Hallābāt, Qaṣr Burqu', Shawmaṛī Wildlife Reserve, Wādī ad Dulayl.

Published records. Jiraish, between Raḥmah and 'Aqaba (DISI, 1983), Azraq, Shawmaṛī Wildlife Reserve (DISI *et al.*, 1988); Petra (GASPERETTI, 1988) Al Karak, Mu'tah (El Oran *et al.*, 1994), 25 km N 'Aqaba (AL ORAN *et al.*, 1997), Azraq, Shawmaṛī Wildlife Reserve, Qaṣr Burqu' (DISI *et al.*, 1999), El 'Aina (DISI *et al.*, 2001).

Systematics. MARX (1953) revised this genus and included *Naja morgani* as a synonym for *W. aegyptia*.

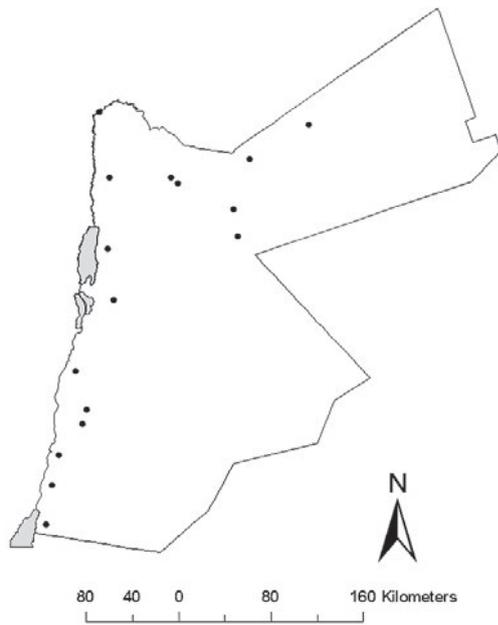


Fig. 98. Distribution of *Walterinnesia aegyptia* in Jordan.

NILSON & RASTEGAR-POUYANI (2007) separated the eastern populations of *Walterinnesia* in Iran, Iraq and eastern Saudi Arabia under the name *Walterinnesia morgani* and considered *Walterinnesia aegyptia* as the valid taxon in Egypt, Israel, western Saudi Arabia, and Jordan. This was based on the significantly lower number of anterior dorsal scale rows, lower number of ventrals, subcaudals, and united subcaudals in *W. morgani*. Also juveniles of *W. morgani* have a colour pattern, consisting of 25 to 33 reddish crossbars that are not found among *W. aegyptia* juveniles.

Diagnosis. A stout snake with a small head slightly distinct from neck, with large shields dorsally, and a short tail. Proteroglyphous. The fixed grooved fangs positioned near the front corner of the mouth under each nostril and in front of the eye. Rostral broader than deep. Internasals same length as prefrontals. Frontal length more than its width. Posterior nasal in contact with single PO; two PtO, one subocular. Temporals 2+3; posterior temporals 3/3. Seven UL, the 3rd and 4th enter the eye. Nine LL, first four in contact with the anterior chin shield. Scale rows at midbody 21–23, VS 180–200, CS 40–53, first 1–22 single, remainder paired. Anal divided. Sexual dimorphism is expressed in both males and females of *W. aegyptia*. Males have fewer ventrals, 178–190, than females, 191–210; males have more subcaudals (42–50) than females (39–48), also males have more undivided subcaudals (4–22) than females (1–5) (DMI'EL *et al.*, 1990). The largest total length of a mature specimen from Arabia measures about 132 cm long and tail is 15cm (GASPERETTI, 1988;

AL-SADOON, 1989). The largest measured specimen from Jordan was 110 cm.

Colouration. Dorsal body is uniformly shiny black and bluish black ventrally (Fig. 92).

Habitats and ecology. The Black Desert Cobra was found in all types of habitats in Jordan. It was found in extreme desert habitats in the eastern desert and Wādī 'Araba, as well as in mountain ranges near Al Karak and As Salt areas. In the last two decades a considerable increase in the number of the Black Desert Snakes were encountered. This increase is associated with the expansion of agricultural settlements in the Eastern Desert and Wādī 'Araba resulting in an increase in number and range of distribution of the Green Toad (*Bufo viridis*). The authors believes that this species is a follower of agriculture, toads inhabiting the newly established farms in the Eastern Desert may attract this snake since it constitutes one of its major food items in Jordan. This fossorial elapid was found frequently as road-kills in Wādī 'Araba. ANDERSON (1963) collected *W. morgani* from Iran in and around gardens and housing areas. However, GASPERTTI (1988) stated that it is a rare or rarely seen in Arabia. It is highly secretive spending most of its time in mammal burrows or those of the large spiny-tailed lizard (LEVITON *et al.*, 1992).

Biology. Its behavior is very differently between day and night time. During the day, it is slow-moving, but at night, it is aggressive and moves very fast. It was encountered at night being attracted to trapped rodents near the Dead Sea area. On one occasion in Qaṣr Burqu', it was observed swimming in a pool. When attacked, it usually hisses loudly and strikes sideways, with its head pointed toward the ground in an S-shaped posture anteriorly often with the mouth closed. Its body swells and shrinks by inflating the lungs. It does not stretch the skin of the neck like *Naja naja* or other related species. Similar observations were reported earlier (GASPERETTI, 1973 & 1976).

ZINNER (1971) reported on its nocturnal foraging behavior in southern Palestine. He stated that this snake is poor-sighted and depends on olfaction to locate its prey. The Green Toad, *P. viridis*, and the Spiny-tailed Lizard, *Uromastix aegyptia*, were recovered from its stomach (AMR & DISI, 1998). DISI *et al.* (2001) observed hatchlings during September.

Remarks. This species can be easily confused with *D. jugularis* based on the colour. As stated earlier, the distribution range and the presence of the first two to nine single subcaudal scales is very characteristic of this snake.

Family Viperidae OPPEL, 1811

Solenoglyphous. The maxilla has two sockets, where hollow and replacement fangs are fitted with highly modified, movable skull bones allowing for operative movement of the hollow long recurved anteriorly-positioned fangs. Broad triangular heads covered by small scales, juxtaposed or imbricate, which are located high and oblique in the head. Nostrils point upwards. Elliptical pupil in the eye; 31–35 rows of keeled dorsal scales at midbody, those on flanks are slanted ventral and their keels are serrated. Ventrals broad (GASPERRETI, 1988). Tail is very short with either paired or entire subcaudal scales. Dorsal scales are keeled at various levels, and the ventral scales are wide and broad.

Recent molecular studies on this family in the Middle and Near East revealed new aspects of taxonomic treatment for many species (HERRMANN *et al.*, 1992; LENK *et al.*, 2001; STÜMPPEL & JOGER, 2009). In Jordan this family is represented by the subfamily Viperinae and includes five genera (*Cerastes*, *Daboia*, *Echis*, *Macrovipera* and *Pseudocerastes*).

Key to the Family Viperidae

- 1 Horny projections that consist of small scales situated above eyes (99A) *Pseudocerastes fieldi*
- Horny projections that consist of one large scale situated above the eye is present or absent (99B) 2



Fig. 99. A. Horny projections that consists of small scales. B. Horny projections that consists of one large scale.

- 2 Horny projections that consist of one large scale situated above the eye are present *Cerastes gasperettii gasperettii*
- Horny projections that consist of large scale situated above the eye are absent 3
- 3 Subcaudals single, 3–4 layers of scales between upper labials and eye, lateral scales obliquely arranged *Echis coloratus*
- Subcaudals divided, more than 4 layers of scales

- between upper labials and eye, lateral scales not obliquely arranged 4
- 4 Scale rows fewer than than 30, 160–166 ventral scales 5
- Scale rows more than 30, 146–158 ventral scales *Cerastes gasperettii mendelsohni*
- 5 Supraoculars divided into 5 scales, ventral scales 155–181 *Macrovipera lebetina*
- Supraoculars intact and bordering eye, ventral scales 160–166 *Daboia palaestinae*

Genus *Cerastes* LAURENTI, 1768

The head is clearly distinct from the neck and covered with small juxtaposed feebly keeled imbricate scales. Eyes are large with vertical pupils and separated from the upper labials by four to five series of small scales. Nostrils directed upwards and outwards. Dorsal scales are keeled with apical pits in 23–25 rows, and the ventral scales are feebly keeled on both sides. Tail is distinctly short, anal plate is entire and all subcaudals are paired. In some populations, a horny projection, consisting of a single scale, extends above the eye. In southwest Asia, this genus is represented by two species, *Cerastes gasperettii* and *Cerastes cerastes*.

Cerastes gasperettii gasperettii LEVITON & ANDERSON, 1967

Cerastes cornutus ANDERSON, 1896. – A Contribution to the Herpetology of Arabia, with a preliminary list of the reptiles and batrachians of Egypt, p. 334.

Aspis cerastes SCHMIDT, 1939. – Field Museum of Natural History, Zoology Series, **24**: p. 88.

Cerastes cerastes HAAS, 1957. – Proceedings of the California Academy of Sciences, **29**: p. 82. – DISI, AMR & DEFOSSE, 1988, *The Snake*, **20**: p. 49.

Cerastes cerastes gasperettii LEVITON & ANDERSON, 1967. – Proceedings of the California Academy of Sciences, **39**: p. 183. – GASPERETTI, 1988, *Fauna of Saudi Arabia*, **9**: p. 335. – LEVITON, ANDERSON, ADLER & MINTON, 1992, *Handbook to the Middle East Amphibians and Reptiles*, p. 112.

Cerastes cerastes GRUBER, 1989. – *Die Schlangen Europas und rund ums Mittelmeer*, p. 173.

Cerastes gasperettii DISI, MODRÝ, NEČAS & REFAI, 2001. – *Amphibians and Reptiles of the Hashemite Kingdom of Jordan*, p. 327. – VENCHI & SINDACO, 2006, *Annali del Museo Civico di Storia Naturale "G. Doria"*, Genova, **98**: p. 300.

Table 22. Scale counts and measurements (mm) for *Cerastes gasperettii gasperettii* specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0404	♀	157	31	620	30
MUM0425	♀	156	30	509	42

**Fig. 100.** The Arabian Horned Viper, *Cerastes gasperettii gasperettii*, from Wādī Ramm without the horns.**Fig. 101.** The Arabian Horned Viper, *Cerastes gasperettii gasperettii*, from Al Hazīm with horns.

Common name. Desert Sand Viper, Arabian Horned Viper.

Range. Jordan, Arabia to western Iran.

Distribution in Jordan. Fig. 102.

Material examined (N=2). MUM 0404 & 425, April, 1992, Ad Dīṣah (Wādī Ramm).

New localities. Al Inab.

Published records. Wādī Ramm (DISI *et al.*, 1988), Ad Dīṣah (EL ORAN *et al.*, 1994), Al Hazīm (DISI *et al.*, 1999), Wādī Ramm (ABU BAKER *et al.*, 2004).

Systematics. WERNER *et al.* (1991) and WERNER & SIVAN (1992) distinguished between *Cerastes cerastes* and *C. gasperettii*. The former is distributed in North Africa, into the Negeb desert; however, it does not penetrate to Wādī 'Araba. WERNER *et al.* (1999) considered the populations of south-western Arabia as *Cerastes cerastes hoofieni*, and they referred to the hornless population in Wādī 'Araba as *Cerastes gasperettii mendelssohni*. However, *Cerastes gasperettii gasperettii* is the subspecies commonly found in eastern and northern Arabia.

Diagnosis. Head triangular and broad, wide flattened and clearly distinct from neck, covered with small irregular tubercularly keeled scales. *C. g. gasperettii* is characterized by a thick body and short tail. Pupil elliptical. Eyes separated from labials by rows of small scale; absence of the cluster of enlarged scales at

midoccipital region of head between the eyes. A pair of superocular horn-like spiny scales above the eye can be either present or absent. If horns are present they point externally; four to five superlabials scale rows, the first supralabial relatively small. 12–15 UL. 13–15 LL. Number of scales in ocular ring 12–14. More than four to five rows of scales between the eyes. Dorsal scales heavily keeled with apical pits. Lateral scales are smaller laterally keeled serrated and arranged in an oblique series. MBS 31–35; VS 152–164; subcaudals divided and vary from 33–37. Anal scale undivided. The Sand Horned Viper exhibits sexual dimorphism as follows: head of males larger including length, depth and width; higher number of subcaudal and fewer dorsal scale rows; longer tail length and fewer ventrals (over 153 in males and more than 155 in females) and wider eye diameter. Maximum length 85 cm (most specimens are about half that size). Females grow larger than males. Table 22 indicates some scale counts and measurement for this species.

Colouration. The colour varies regionally and can be reddish, yellowish or grey, depending upon the actual colour of the sand where a population lives. The pattern consists of indistinct brown spots in four to six longitudinal series, a dark streak on the tail and a variable head pattern (Fig. 100 & 101). The head pattern is accentuated in some populations of *C. g. gasperettii*, in which case the dark band between the eye and the angle of mouth is accompanied dorsally by a light band.

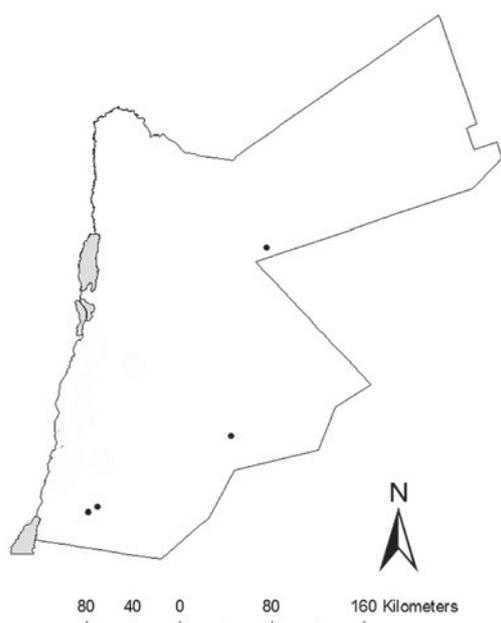


Fig. 102. Distribution of *Cerastes gasperettii gasperettii* in Jordan.

Habitats and ecology. The Arabian Horned Viper is a true psamophile species. It was seen and collected from sand dunes in Wādī Ramm and Al Hazīm. Also, they inhabit sandy soil where vegetation or rocky outcrops provide shelters. In Al Hazīm, the area is dominated by *Haloxylon persicum* and *Nitraria retusa*. It is adapted to these habitats through its morphology, physiology and behavior. During the daytime it hides in rodent borrows, and specimens have been seen buried in the sand with eyes protruding from the ground surface. It starts its activity after sunset and is active at night, moving across the sand searching for food, especially rodents. Side-winding trails are very characteristic for this viper. It was collected near roads in Wādī Ramm.

Biology. *C. g. gasperettii* feeds mostly on rodents (*Gerbillus nanus*, *Gerbillus dasyurus*, and *Meriones crassus*) as well as *Scincus scincus* (AMR & DISI, 1998). In the laboratory, when offered laboratory mice, it will first attack and bite the mouse, then leave it until it becomes motionless, and finally it will swallow it head first. In captivity it can survive for a long period. The authors kept one specimen collected from Al Hazīm for over four years, and fed it on white mice. *C. g. gasperetti* uses side winding type of locomotion on both sand dunes and hard soil. It submerges into the sand quickly using its keeled and serrated lateral scales in a rocking motion. This process begins posteriorly, extending anteriorly until the entire body and head is buried leaving just the eyes and nostrils exposed. It forages using the sit and wait strat-

egy. *C. g. gasperetti* is oviparous, laying eggs (8–23 eggs) in abandoned rodent burrows. Eggs need eight to nine weeks to hatch. Hatchlings measure 15–18 cm and feed on small lizards and nestling rodents (MEHRTENS, 1987).

Remarks. All previous records of *C. cerastes* from Wādī ‘Araba (DISI, 1983; DISI *et al.*, 1988; EL ORAN *et al.*, 1994 and 1997) are considered in this treatment as *Cerastes gasperettii mendelssohni*.

Cerastes gasperettii mendelssohni WERNER & SIVAN, 1999

Vipera cerastes STRAUCH, 1869. – Annuaire Musée Zoologique de l’Académie Impériale des Sciences de St.-Pétersbourg, **14**: p. 112.

Cerastes cornutus ANDERSON, 1896. – A Contribution to the Herpetology of Arabia, With a Preliminary List of the Reptiles and Batrachians of Egypt, p. 334.

Cerastes cerastes DISI, AMR & DEFOSSE, 1988. – The Snake, **20**: p. 49.

Cerastes cerastes cerastes LEVITON & ANDERSON, 1967. – Proceedings of the California Academy of Sciences, **39**: p. 183.

Cerastes cerastes gasperettii GASPERETTI, 1988. – Fauna of Saudi Arabia, **9**: p. 335.

Common name. Not determined.

Range of distribution. Wādī ‘Araba.

Distribution in Jordan. Fig. 103.

Material examined (N=24). JUMR 694, August 1981, Wādī Khuneizīra. JUMR 909–910, 21 May 1982, Wādī Faynān. JUMR 1000, 3 September 1982, Wādī Fidān. JUMR 1127–1128, 5 September 1982, Between Dhahel and Wādī Fidān. JUMR 911, April 1982, Wādī Khuneizīra. JUMR 986, 1982, Wādī Fidān. JUMR1000, 1982, Wādī Fidān. JUMR 1125, 5 September 1982, Methla Station. JUMR ???, September 1983, Gharandal. JUMR ???, September 1983, Bīr Madhkūr. JUMR1027–1028, September 1983, Dhahel. JUMR ???, September 1983, Qā’ as Sa’dīyīn. MUM 0029 & 30, 28 May 1991, Ar-Risha (Wādī ‘Araba). MUM 0400–401, 414–417 & 419, 1992, Wādī ‘Araba.

Published records. Mitlah, Wādī Faynān, Wādī Fidān, Wādī Khuneizīra, between Dhahel and Wādī Fidān (DISI, 1983), Bīr Madhkūr, Gharandal, (DISI *et al.*, 1988), Ar Risha (EL ORAN *et al.*, 1994), Wādī Fidān (AL ORAN *et al.*, 1997).

New localities. Rahmeh, Ghawr aṣ Ṣāfi, Ghawr Feifa.

Diagnosis. Occipital tubercles and supraocular horns always absent; 12–13 UL; 13–15 LL; 12–14 scales surrounding the eye; 31–35 scale rows at midbody; VS 146–158, anal divided: subcaudals divided and vary from 31–36. Extremely short tail. Sexual dimorphism appear clearly: Males in comparison with females have shorter SV, longer tail, dorsal scale length dorsals at midbody, less ventrals and more caudals.

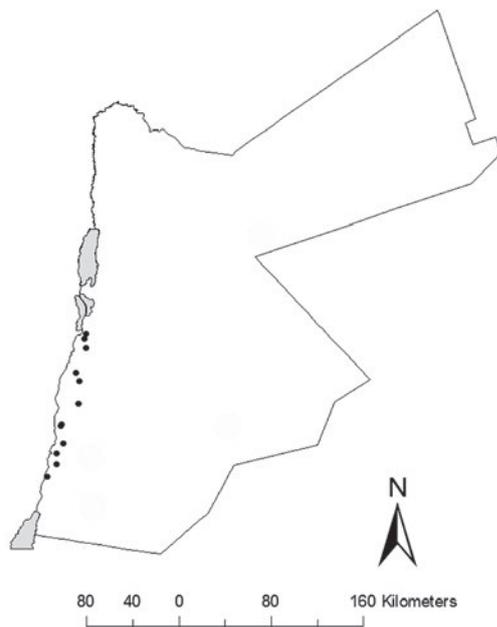


Fig. 103. Distribution of *Cerastes gasperettii mendelssohni* in Jordan.

Adult SV measures 443 mm; tail is 50–66 mm (WERNER *et al.*, 1999).

Coloration. Irregular small dark dots with irregular shapes and sizes are scattered on head. Laterally dark band is accentuated by whitish upper margin extending between the eye corners of mouth. Dorsal background is sandy beige. Dorsal pattern differs within and among members of this subspecies. Middorsal blotches are represented by two dorsolateral series of smaller roundish blotches alternately positioned on left and right sides. These may form a zigzag pattern on same part of the body, oblique pairs of blotches or checkered throughout, but to a lesser degree regular discrete blotches have brown color. Ventrums are white.

Habitats and ecology. This viper is endemic to the sand dunes of Wādī 'Araba between Ghawr aṣ Ṣāfī in the north and 'Aqaba in the south. It is nocturnal, and encountered hiding into rodent burrows or at the base of shrubs buried in soft sand except for the protruding nostrils and eyes. *Cerastes gasperettii mendelssohni* shows a positive correlation with temperature parameters and a negative correlation with humidity (WARBURG, 1964; DISI, 1987).

Biology. *Cerastes gasperettii mendelssohni* is very noisy when irritated, and emits a loud puffing-hissing sound from the mouth and a rasping hissing sound by rapidly rubbing the inflated loops of its body against each other, with their oblique and carinated lateral scales. On one occasion it attacked an intruder, vigor-

ously trying to follow him. It feeds on rodents; three examined specimens had undigested *Gerbillus* and/or *Meriones* in their stomachs. It can survive for several months without food. One specimen with no apparent food intake on capture, was kept alive for nine months, and declined all offered food; it probably could stay alive without food for longer periods. In captivity, *C. g. mendelssohni* prefers to eat lizards to albino mice (DISI, 1983).

Remarks. BARBOUR (1914) reported on the collection of *C. cerastes* (= *C. g. mendelssohni*) from Al Karak. He stated that they were from the surrounding deserts of Wādī 'Araba. This Wādī 'Araba subspecies is completely hornless and has a shorter tail (usually fewer than 33 subcaudals) than typical *gasperettii*. This subspecies is endemic to Wādī 'Araba.

Genus *Daboia* GRAY, 1840

The head is distinct from the neck and covered by small scales. Eyes moderate to small in size, with vertical pupils. Eyes are separated from the upper labials by small scales in 2–3 rows.

Daboia palaestinae (WERNER, 1938)

Vipera palaestinae WERNER, 1938. – Zool. Anz., **122**: p. 113. – WELCH, 1983, Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphisbaenia, Sauria and Serpentes, p.87. – DISI, AMR & DEFOSSE, 1988. The Snake, **20**: p. 49. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 339. – JOGER, AMR & AL-ORAN, 2005, Arab Gulf Journal of Scientific Research, **23**: p. 138.

Daboia (Daboia) palaestinae GRUBER, 1989. – Die Schlangen Europas und rund ums Mittelmeer, p. 211.

Vipera (s.l.) *palaestinae* VENCHI & SINDACO, 2006. – Annali del Museo Civico di Storia Naturale "G. Doria", Genova, **98**: p. 306.

Daboia palaestinae STÜMPPEL & JOGER, 2009. – Zookeys, **31**: p. 181.

Common name. Palestine Viper

Range. Palestine, Jordan, Lebanon and Syria.

Distribution in Jordan. Fig. 105.

Material examined (N=18). JUMR 260, April 1978, 'Ibbīn. JUMR 262, 1978, 'Ammān area. JUMR 356, El Hamma, 1979. JUMR 456, April 1979, El Hamma. JUMR 369, August 1978, Dayr Abū Sa'id. JUMR 466, June 1980, Ṣāfūt. JUMR 865, April 1982, 'Al'al. JUMR 1584, May 1985, El Karāma. JUMR 1930, June 1990, Nā'ūr. JUMR 2156, November 1995,



Fig. 104. The Palestine Viper, *Daboia palaestinae* from Al Hamma, northern Jordan.

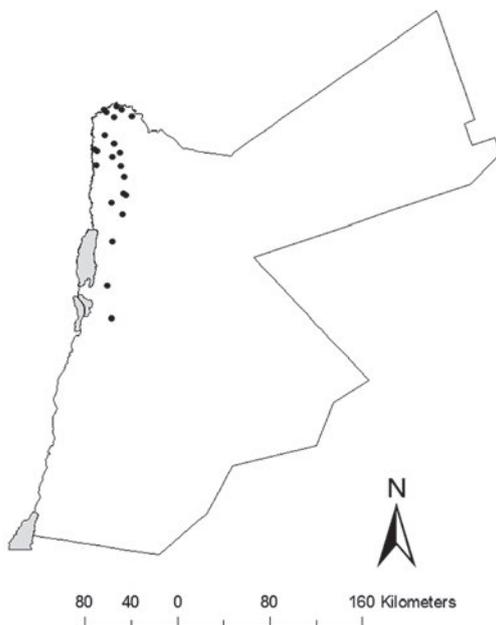


Fig. 105. Distribution of *Daboia palaestinae* in Jordan.

Nā'ūr. JUMR 2573, August 1998, Salīhī. JNHM 233, 17 May 1982, Ḥātīm. JNHM 425, 14 November 1982, 'Aqrabā. JUSTM 389, 1996, 'Aqrabā. JUSTM 395, 19 May 1997, 'Aqrabā. JUSTM 413, May 2001, Saḥam. JUSTM 418, 2002, El Hamma. MUM 0501, 29 November 1993, Al Mazār.

New localities. Al Shajarah, Al Zemaleyha, Birqish, Eira, Homrat Al Sahen, Kuraymah, Shaikh Hussain, Wādī al Yābis, Wādī Ibn Hammad.

Published records. 'Al'al, 'Ammān area, Dayr Abū Sa'īd, El Hamma, Ibbīn, King Hussain Bridge, Šāfūṭ (DISI, 1983), El Karāma, Ḥartā, Ḥātīm, Wādī Sha'eb (DISI *et al.*, 1988), Al Mazār (EL ORAN *et al.*, 1994), Dibbīn Nature Reserve (DAMHOUREYEH *et al.*, 2009).

Materials recorded in other museums. BM 1937.9.4.1, Allenby Bridge (= King Hussain Bridge). ZFMK 58030, NW Jordan, Ajlūn Mountain-Kufranja.

Systematics. This species may be more closely related to *Daboia russelii* and *Macrovipera* spp. than

with *Vipera* (GROOMBRIDGE, 1980; HERRMANN *et al.*, 1992; LENK *et al.*, 2001).

Diagnosis. Head triangular, distinct from neck and covered by small scales. In contrast to other Jordanian viperids, there is a single large plate on top of each eye. Supraocular intact and bordering eye. Two scale rows between eye and upper labials. 9–11 UL. 12–14 LL 24 or 25 midbody scale rows, VS 60–166, CS 35–44. Anal undivided. Body stout and tail tapers abruptly behind cloaca. Largest *Daboia* species (both sexes up to 130 cm).

Colouration. Ground colour grey to ochre, with a series of light brown, oval spots with lighter centers and pale edges; the spots may be fused to form a zigzag band. Top of the head has two V-shaped, brown occipital bands with dark edges in front of which is one large, round brown patch. Side of head with yellow markings in adults (Fig. 104). Yellow colour may disappear when the snakes are held in captivity (MENDELSSOHN, 1963).

Habitats and ecology. The Palestine Viper is associated with oak and pine forested areas. Some remnant populations still existing in deforested mountains as in Al Karak Governorate. Nowadays it occurs in rocky hillsides, plantations, animal farms and near human settlements. This viper is a nocturnal species. It climbs trees looking for fledging birds or to ambush arboreal reptiles and mammals. There is a considerable increase in the number of this viper in the Jordan Valley in correlation with the expansion of cultivated land and irrigated citrus and banana farms, which in turn has created an abundance of small rodents, especially mice and rats. Also, these places offer humid oviposition sites and the moisture needed by this viper to drink.

Biology. MENDELSSOHN (1963) found rodents (*Microtus guentheri*, *Meriones tristrami* and *Rattus rattus*), an insectivore (*Corcidura russula*), a bird (Goldfinch, *Carduelis carduelis*), and reptiles (*Laudakia stellio*, *Acanthodactylus schreiberi*) ingested by the Palestine Viper. AMR & DISI (1998) recovered remains of *Passer domesticus* and *Chamaeleo chamaeleon* from *D. palaestinae* in Jordan. The Palestine Viper is oviparous. MENDELSSOHN (1963) suggested that copulation occurs during May, and eggs are laid in August, in a single clutch. The number of eggs ranges between 7–22.

This viper is an excellent climber and is nocturnal though it may bask close to its hiding place in spring. Excited *D. palaestinae* hisses and the anterior part of the body becomes S-shaped, ready to strike. As it becomes more excited it flattens the forepart of its body. Six adult specimens were once found under a rock in

January 1987 in the Jordan Valley during their hibernation, suggesting that aggregation behavior leads to either mating or temperature and moisture conservation behavior.

Remarks. Perhaps Al Mazār region near Al Karak is the southernmost range of distribution in Jordan.

Genus *Echis* MERREM, 1820

The head is distinct from the neck and covered with small scales. Eyes have vertical pupils, and are separated from the upper labials by three to four series of small scales. Dorsal scales are keeled with apical pits, and the ventral scales are rounded. Tail is relatively short; anal plate and all subcaudals are entire. The genus *Echis* includes several species distributed in Africa and from southwest Asia to India and eastwards. In Jordan, this genus is represented by the single species *Echis coloratus*.

Echis coloratus GÜNTHER, 1878

Echis froenata DUMÉRIL, BIBRON & DUMÉRIL, 1854. – *Erpétologie générale ou Histoire Naturelle complète des Reptiles*, 7: p. 1448.

Echis colorata GÜNTHER, 1878. – *Proceedings of the Zoological Society of London*, 1878: p. 978. – BARBOUR, 1914, *Proceedings of New England Zoology Club*, 5: p. 91. – WELCH, 1983, *Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphibia, Sauria and Serpentes*, p. 83.

Echis coloratus DISI, AMR & DEFOSSE, 1988. – *The Snake*, 20: p. 49. – GASPERETTI, 1988, *Fauna of Saudi Arabia*, 9: p. 348. – LEVITON, ANDERSON, ADLER & MINTON, 1992, *Handbook to the Middle East Amphibians and Reptiles*, p. 114. – DISI, MODRÝ, NEČAS & REFAI, 2001, *Amphibians and Reptiles of the Hashemite Kingdom of Jordan*, p. 331. – VENCHI & SINDACO, 2006, *Annali del Museo Civico di Storia Naturale "G. Doria"*, Genova, 98: p. 300. – STÜMPPEL & JOGER, 2009, *Zookeys*, 31: p. 187.

Common name. Arabian saw-scaled viper, Burton's carpet-viper.

Range. Eastern Egypt, Sinai, Palestine, Jordan, Arabian Peninsula.

Distribution in Jordan. Fig. 107.

Material examined (N=4). IUMR 210, 16 June 1978, As Sulaykhāt. IUMR 663, 9 May 1981, Wādī Sha'eb. IUSTM 390, 29 September 1996, Al Batheyah. MUM 0301, 27 June 1992, El 'Aina.



Fig. 106. The Arabian saw-scaled viper, *Echis coloratus*, from Jabal Mas'ūdah.

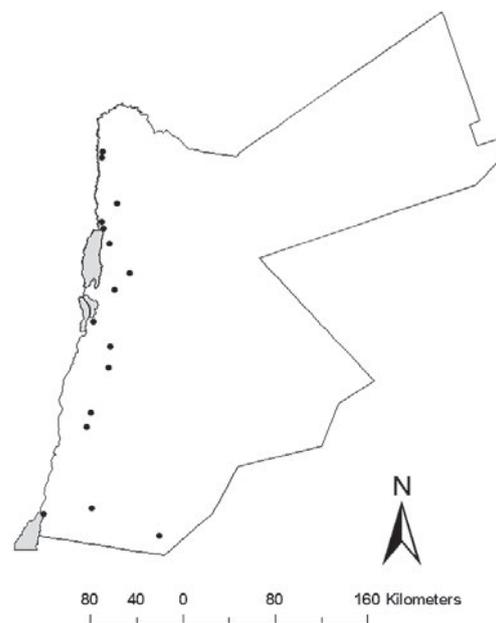


Fig. 107. Distribution of *Echis coloratus* in Jordan.

Published records. 'Aqaba, Wādī Al Karak (BARBOUR, 1914), As Sulaykhāt, Swaeimeh, Wādī Sha'eb (DISI, 1983), El Karāma, Ghawr aş Şāfī, Wādī Sha'eb (DISI *et al.*, 1988); El 'Aina (EL ORAN *et al.*, 1994), Wādī Ramm (ABU BAKER *et al.*, 2004).

New localities. Al Magtas, Al Mudawwarah, Humrat Mā'in, Jabal Mas'ūdah, Petra.

Materials recorded in other museums. MCZ R-9693, January 1914 – 31 December 1914, Petra, *leg.* J. C. PHILLIPS & W. M. MANN.

Systematics. A problematical species, apparently quite distant from the rest of the *Echis* species, but in captivity viable hybrids between *Echis "carinatus"* (= *pyramidum*) *leakeyi* and *E. coloratus* were produced. Its subgenus allocation is not clear. STIMSON (1974) proposed the suppression of the older name *E. froenata* in favour of *E. coloratus*.

Diagnosis. Head very distinct from neck, Three to four scale rows between the eyes and upper labials. 12–15 UL, 13–15 LL. Nostril is in a single or divided nasal and a series of scales separates the nasal from rostral. Scale rows 31–37, VS 152–205, CS 44–57. Anal scale entire, subcaudals single. *Echis* is different from other vipers by single (undivided) subcaudal scales. Males are larger than females and have longer tails. Maximum length 83 cm.

Colouration. Ground colour quite variable: yellowish-grey or brownish-grey, but may be reddish-brown or pink in areas of red sandstone or granite (Fig. 106). On the back, there is a row of grayish-white, elongate rhomboid blotches or crossbars with dark edges. Head without distinctive marks, except a brownish-grey band from the nostril to the edge of the mouth. The light dorsal blotches may have a narrow dark border. The pattern of orientation of the blotches and crossbars varies even on the same animal. On the side of the body, there is a row of brownish blotches.

Habitats and ecology. Carpet Vipers are abundant in the steep, dry rocky hillsides of the mountains which surround the Jordan Valley and Wādī ‘Araba and also occurs in Petra and Wādī Ramm. It penetrates into the Mediterranean biotope through the wadi systems emerging from the Jordan Valley and Wādī ‘Araba. It favors hard ground covered by rocks (MENDELSSOHN, 1965; ARNOLD & GALLAGHER, 1977) with widely scattered vegetation dominated by the following plants: *Retama raetam*, *Salvia graveolens*, and *Urginea maritima* (DISI, 1983). In El Quweira the Carpet Viper was captured on a tree. It hides under medium-sized rocks. This species shows a positive correlation with temperature and humidity parameters (WARBURG, 1964; MENDELSSOHN, 1965; DISI, 1987). In early spring this viper is found close to the surface of the ground under rocks or logs. As the season becomes hotter in the summer, the vipers retract deeper into their burrows (DISI, 1987). Vertical distribution in the southern part of its range reaches up to 2600 m.

Biology. This is a nocturnal viper. On rocky slopes its movement is rectilinear or serpentine, but on hard, flat surfaces it side-winds. Like *Cerastes*, *Echis* spp. warns enemies by rubbing specialized lateral scales against each other. When threatened, this viper always starts rubbing its scales, then moves rapidly and immediately strikes with great speed in all direction with the head raised upward in an S-shape. The Carpet Viper feeds on rodents (*Gerbillus* sp. and *Acomys* sp.), as well as on lizards, anuran amphibians and arthropods (MENDELSSOHN, 1965). *E. coloratus* is oviparous and copulation takes place in May and June; females lay eggs mostly in July but may extend

later. Females may not be able to produce eggs every year. The normal clutch size ranges between 6–10 eggs but sometimes may reach 21 eggs for some females. The eggs of *E. coloratus* are more adhesive than the eggs of many other snakes, and the females tend to glue their eggs to hard surfaces such as rocks (MENDELSSOHN, 1965).

Remarks. BABOCSAY (2003) described the new subspecies, *Echis coloratus terraesanctae*. Specimen JUMR 663 from Wādī Sha‘eb was examined by BABOCSAY (2003) and proved to belong to this new subspecies. This new subspecies is most common around the Dead Sea area and the Jordan Valley. It differs from *Echis coloratus coloratus* by its fewer ventral scales (187.8–190.1 in males and females respectively) and the high number of dorsal scales.

Genus *Macrovipera* REUSS, 1927

Broad head, triangular, distinct from the neck; blunt and rounded snout. Two to three rows of subocular scales; supraoculars fragmented in all taxa, with a few exceptions. Large-bodied species that may exceed 150 cm, except *M. schweizeri*. 23–27 keeled dorsal scales at midbody. (HERRMANN *et al.*, 1992).

Macrovipera lebetina obtusa (DWIGUBSKY, 1832)

Coluber lebetinus LINNAEUS, 1758. – Systema naturæ per regna tria naturæ, p. 218.

Vipera obtusa DWIGUBSKY, 1832. – Opyt Estestvennoi Istobrii, Gady, 3: p. 30.

Vipera lebetina obtuse WELCH, 1983. – Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphisbaenia, Sauria and Serpentes, p. 87.

Macrovipera lebetina DISI, MODRÝ, NEČAS & REFAL, 2001. – Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 333. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, 98: p. 302.

Common name. Levantine Viper.

Range. Eastern Turkey to Pakistan (JAGER, 1984), with an isolated relict population in Algeria/Tunisia (NILSON & ANDREN, 1988).

Distribution in Jordan. Fig. 109.

Material examined (N=2). JUSTM 501, June 1994, Sail El ‘Aina. JUSTM 621, June 2005, Al Ḥarir.

Published records. Sail El ‘Aina, 25 km SE of Al Karak, SE of Aṭ Ṭāfila (AL-ORAN *et al.*, 1998), Ḍānā Nature Reserve (DISI *et al.*, 2001).

Table 23. Comparison of *M. l. obtusa* specimens studied from Jordan with those in the following museums: BM, GM, NMW, SMF, ZSM, ZMB and JUMR, showing that the population in Jordan belongs to *M. l. obtusa*.

Character	Specimens from Jordan (n = 4)	AL ORAN <i>et al.</i> (1998)	<i>M. l. obtusa</i> (n = 13) (European museums*)	GASPERETTI (1988)
Body length (mm)	265–935	265–935	67–95	96 males 135 females
Tail length (mm)	43–142	43–142	10–13.8	
Midbody dorsal scale count	25–27	24–27	23–25	23–37
% of Tail length/SV length	15	13–15	15	–
Preanal	Single	–	Single	–
Ventrals	162–168	162	156–174	126–177 (all males) 152–181 females
Subcaudals	41–43	35–49	43–49	33–51 males 28–58 females
Supralabials	11–12	9–11	9–12	9–12
Infralabials	12	11–15	11–14	–
Scales around the eye	16–17	11–18	16–19	12–18
Scale rows between eye and supralabials	2–3	2–3	2–3	2–3
Interocular scale count	9–10	7–11	7–11	–
Canthas	2–3	2–3	2–3	–
Apicals	3	2–3	2–3	–

* Specimens examined at JUMR collection lie within the range reported by AL ORAN *et al.* (1998). Notice that *M. l. lebetina* has lower scale counts (126–163), and recorded only from Cyprus.



Fig. 108. The Levantine Viper, *Macrovipera lebetina obtusa*, from the vicinity of Aţ ʿAfla (D. Modrý).

Materials recorded in other museums. HLMD RA2564, April 1997, Al ʿHarīr.

Systematics. The morphology of specimens collected from Jordan falls well within the variability of Levantine populations of *M. lebetina*. Only the number of supralabials appears exceptionally high, but this may be a counting error. The subspecific allocation of these vipers is under debate; they could be assigned to *M. l. euphratica* MARTIN, 1838 if that taxon were recognized. Most authors, however (e.g. JOGER, 1984, LEVITON *et al.*, 1992), regard *euphratica* as a synonym of *M. l. obtusa* DWIGUBSKY, 1832. HERRMANN

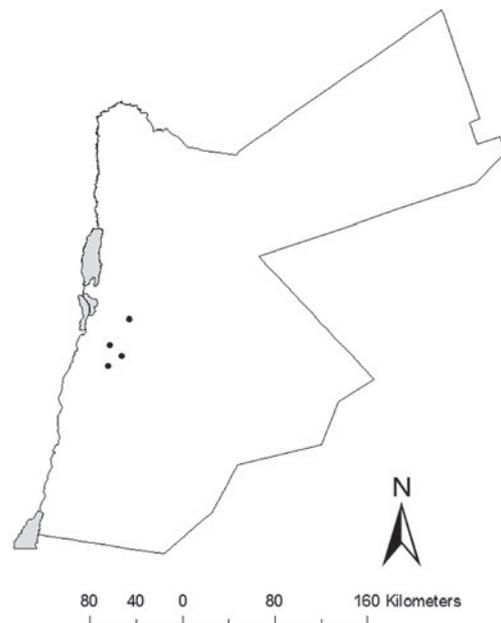


Fig. 109. Distribution of *Macrovipera lebetina* in Jordan.

et al. (1992) separated the Levantine viper, *M. lebetina*, from *Vipera* and *Daboia*, together with three other related species.

Diagnosis. The Levantine Viper has a fat body with a head triangular clearly separated from neck, covered by small, imbricate, keeled and smooth scales on tip

of snout. Solenoglyphous. Snout rounded obtusely. Supraoculars completely divided into five scales. Fourth supralabial enlarged, positioned under the eye. Nostril lateral, in large nasal shield. Eye surrounded by circle of 11–18 small circumorbital scales and separated from upper labials by two to three rows of scales; interocular scales 7–11. Two to three canthus. Two to three apicals. 12–14 LL. Dorsal scales keeled with the exception of lateral of most rows. MBS 23–25; VS 155–181 and in females slightly higher; 35–44 divided CS. Anal entire. Table 23 shows a comparison of *M. l. obtusa* from Jordan and other countries.

Colouration. Dorsal colour yellowish to light gray, with about 35 gray blotches in four longitudinal rows (two laterally and two dorsally), the latter meeting at the middorsal line, but in alternating positions. Head yellowish-gray. A gray stripe from the eye backwards, widening above the jaw angle (Fig. 108). Ventrals darkly pigmented, light posteriorly, powdered with fine dark spots.

Habitats and ecology. One specimen was taken from rocky terrain with scarce vegetation, while the other from an area covered by dense vegetation of *Artemisia herba-alba*. In Jordan, the Levantine Viper is syntopic with other snakes (*E. coloratus*, *W. aegyptia*, *N. tessellata* and *Ophisops elegans*). Both Jordanian localities are situated within the Irano-Turanian zone stretching south from Syria into Jordan to the 30th parallel. AL-ORAN *et al.* (1998) suggested that the Palestine Viper, *D. palaestinae*, is a possible competitor of *M. lebetina* and its presence in Jordan reflects its patchy relictary distribution. The Levantine Viper avoids deserts, high mountains or densely forested areas, however, biogeographically, it is considered an Irano-Turanian species. At ‘Ayn Laḥz,ah, it was encountered among thick bushes lying under stones. In Ḍānā Wildlife Reserve it is found at an altitude of 1400 metres. Also, it was observed during the hot summer at noon immersing its body in the water of a creek.

Biology. MEHRTENS (1987) stated that *M. l. obtusa* lays eggs in the northern parts of its range of distribution and bears living young in the south. Also, TEREŇEV & CHERNOV (1965) reported that *M. l. obtusa* in the Caucasus is live bearers.

Remarks. This relict species is separated by several hundred kilometres from the nearest population in Jabal Al-Arab, southern Syria (BISCHOFF *et al.*, 1998). JOGER (1984) stated that the distribution of the Levantine Viper appears to be localized and disjuncted. Also, he regarded the two subspecies *M. l. turanica* and *M. l. euphratica* as synonyms of *M. l. obtusa*. The

subspecies, *obtusa* has a higher number of ventrals (155–181) and reaches larger body size (150 cm).

Genus *Pseudocerastes* BOULENGER, 1896

Head is distinct from the neck, and covered by small scales. Eyes are small with vertical pupils and separated from the upper labials by three series of scales. A horn-like tubercle made of several layers of scales is situated above each eye. Dorsal scales have club-shaped keels. Tail moderate, with an entire anal plate and all subcaudals are divided (SCHMIDT, 1930).

This genus includes two species, *Pseudocerastes persicus*, distributed in Iraq, Iran, Oman and Pakistan, and *Pseudocerastes fieldi*, confined to northern Arabia, Sinai, Jordan, Palestine and western borders of Iraq with Jordan (LENK *et al.*, 2001).

Pseudocerastes fieldi SCHMIDT, 1930

Vipera persica fieldi MARX & RABB, 1965. – Fieldina: Zoology, **44**: p. 174

Pseudocerastes persicus fieldi ARNOLD & GALLAGHER, 1977. – Journal of Oman Studies, Special Report, **1**: p. 70. – WELCH, 1983, Herpetology of Europe and Southwest Asia: a checklist and bibliography of the orders Amphisbaenia, Sauria and Serpentes, p. 84. – JOGER, 1984, The Venomous Snakes of the Near and Middle East, p. 50. – DISI, AMR & DEFOSSÉ, 1988, The Snake, **20**: p. 49. – GASPERETTI, 1988, Fauna of Saudi Arabia, **9**: p. 325. – LEVITON, ANDERSON, ADLER & MINTON, 1992, Handbook to the Middle East Amphibians and Reptiles, p. 115.

Pseudocerastes persicus GRUBER, 1983. – Die Schlangen Europas und rund ums Mittelmeer, p. 182. – DISI, MODRÝ, NEČAS & REFAI, 2001, Amphibians and Reptiles of the Hashemite Kingdom of Jordan, p. 337. – VENCHI & SINDACO, 2006, Annali del Museo Civico di Storia Naturale “G. Doria”, Genova, **98**: p. 302.

Common name. False Horn Viper, Field’s Horned Viper.

Range. Southern Arabia, Sinai, Jordan, Syria, Palestine and western borders of Iraq

Distribution in Jordan. Fig. 111.

Material examined (N=26). JUMR 324, 198?, Eastern desert. JUMR 350, 198?, Eastern desert. JUMR 436, April 1978, Shawmarī Wildlife Reserve. JUMR 543, 1977, Al Jafr. JUMR 556, April 1978, Shawmarī Wildlife Reserve. JUMR 689, April 1978, Shawmarī Wildlife Reserve. JUMR 908, May 1982, Jāwā. JUMR 926–928, May 1982, Jāwā. JUMR 975, 31 August 1982, 27 Km E Al Karak. JUMR 1706, October, 1986, Qaşr al Ḥallābāt. JUMR 1986, 1991, Al Enab. JUMR

1993, 3 October 1991, Al Hazīm. *JUMR* 2089, 1982–1983, Shawmarī. *JUMR* 2230, June 1998, Shawmarī Wildlife Reserve. *JUMR* 2283, 1997, Eastern desert. *JUMR* 2514, November 1997, Jāwá. *JNHM* 1, June 1981, Jāwá. *JNHM* 5, August 1981, Ar Ruwayshid. *MUM* 0146, 18 August 1991, Ma'ān. *MUM*0187, 20 September 1991, Al Jafr. *MUM* 0300, 16 January 1993, Ma'ān. *MUM* 0315 a & b, April, 1992, Al Jafr. *MUM*0373, 6 October 1992, Ma'ān.

New localities. Bequwyeh, Al Qunaytirah, Azraq, Umm al Qiṭṭayn and Wādī Ramm.

Published records. Bāyir Wells (SCHMIDT, 1930), Wadi Dhoba'i (HAAS, 1951), Al Jafr, Jāwá, Shawmarī Wildlife Reserve, 25 km E Al Karak (DISI, 1983), Al Muwaqqar, H-5 (= Safawi) (DISI *et al.*, 1988), Al Jafr, Ma'ān (EL ORAN *et al.*, 1994), Jāwá, Qaṣr al Ḥallabāt, Shawmarī Wildlife Reserve, SE Al Hazīm (DISI *et al.*, 1999).

Materials recorded in other museums. *FMNH* 11061–11062, 1928, Transjordan (Bāyir), *leg.* HENRY FIELD. *FMNH* 11063, 1928, Transjordan (Um Wua'l), *leg.* HENRY FIELD.

Systematics. MARX & RABB (1965) made *fieldi* a subspecies of *Vipera* (*Pseudocerastes*) *persicus*, which is accepted by GROOMBRIDGE (1980). However, immunological distances of plasma albumins (HERRMANN *et al.*, 1992) and mitochondrial DNA distances (LENK *et al.*, 2001) indicate that the genetic differences between the two have already attained species level. Unfortunately, their allopatric distribution does not allow direct proof of this.

Diagnosis. Head triangular, wide, very distinct from neck, covered with small, imbricate, keeled scales. Snout short and broadly rounded. One series of scales between the nasal and the nostril; nostrils are dorsolaterally positioned and valves present. Supranasal one or two. 14–18 (most common 15–17) scales in ocular ring. On both sides above the eye there are erect horn-like projections formed of several small imbricate scales, its tip ending in two tiny scales. Three series of scales between the eye and labials. 12–14 UL. 14–16 LL, four of which are in contact with the chin shields. 21–22 strongly keeled scale rows at midbody; VS 127–142 (most common 131–135); CS 34–46 (most common 33–38). Anal undivided. Tip of the tail black. Side-winding movements like *Echis* and *Cerastes*, but no differentiated noise-making lateral scales. Maximum length may reach up to 90 cm. Tables 24 and 25 show scale counts and measurements, and Table 26 is a comparison between males and females for *P. fieldi*. Table 27 is a comparison between *P. persicus* and *P. fieldi*.

Colouration. Pale yellowish-grey or brown, with two rows of about thirty darker blotches on the back. In the eastern basalt desert, however, the ground colour is dark grey (Fig. 110). Opposite blotches sometimes



Fig. 110. Field's horned-viper, *Pseudocerastes fieldi*, from Jāwá.

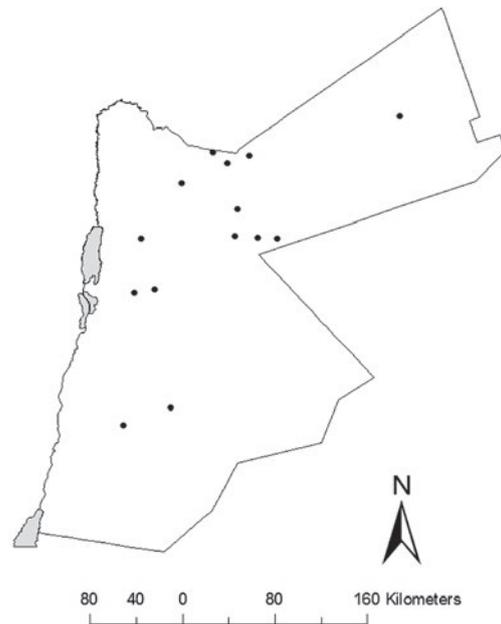


Fig. 111. Distribution of *Pseudocerastes fieldi* in Jordan.

fuse to form transverse crossbars. An additional row of smaller blotches laterally. Ends of ventrals and subcaudals, as well as many dorsal scales, with little black spots. Sides of head with light brown band from the eye backwards and downwards. Maximum length 79 cm (females larger than males).

Habitats and ecology. In Jordan, it is common in the eastern deserts especially the black basalt desert. It is found in extremely arid regions with minimum vegetation. This viper avoids human habitations. The authors caught specimens inside rodent burrows and under large basalt rocks. According to MENDELSSOHN (1965), it inhabits semi-desert with sandy soil and shrub vegetation, may be interspersed with rocks (but neither dune areas nor mountain slopes).

Biology. This is a nocturnal viper. It was found on several occasions foraging at night during June to August in the Safawi area of north-eastern Jordan. It is

Table 24. Scale counts and measurements (mm) for *Pseudocerastes fieldi* for specimens at Mu'tah University Museum.

Specimen No.	Sex	VS	CS	SV	T
MUM0187	♂	136	35	168	22
MUM0300	♀	132	42	370	55
MUM0315a	♂	135	37	162	25
MUM0315b	♂	138	36	166	25
MUM0373	♂	135	37	460	64

Table 25. Scale counts and measurement (mm) for *Pseudocerastes fieldi* specimens at the Jordan University Museum.

Specimen No.	Sex	MBS	VS	SCS	UL	LL	SVL	T
JUM324	ND	22	134	33	12/12	14/15	205	30.1
JUM350	ND	22	133	37	12/12	15/16	282	44.3
JUM436	♂	21	134	38	13/13	16/16	505	65.7
JUM543	ND	22	132	37	12/12	15/15	300	49.4
JUM689	♀	21	133	33	13/13	16/16	490	65
JUM928	♂	21	134	35	12/12	15/15	660	90
JUM975	ND	21	132	36	12/12	14/14	235	33.4
JUM1706	♂	21	132	34	12/12	14/15	520	60
JUM1986	♂	21	131	37	12/12	15/15	465	66
JUM1993	♂	22	132	34	12/12	16/16	780	96
JUM2089	♂	21	133	37	12/12	15/15	510	73.1
JUM2230	♀	22	132	34	12/12	15/15	565	70
JUM2283	♂	21	135	36	12/13	16/16	550	76.3
JUM2514	♀	22	131	33	12/12	15/15	545	55

Table 26. Comparison of some ratios of *Pseudocerastes fieldi* males and females collected from Jordan.

Character	Adult males (n = 8)	Adult females (n = 3)
Head length/SV length	5.77–6.65	5.73–6.18
Head width/ SV length	20.7–34.1	18.4–24.2
Head height/ SV length	2.24–2.85	1.94–2.43

an aggressive viper. The authors kept live animals for over 6 years in captivity, and they were fed on mice.

Remarks. This species was originally described by SCHMIDT (1930) from Bāyir well in the eastern desert of Jordan. BOSTANCI *et al.* (2006) gives a comprehensive comparison between *P. fieldi* and *P. persicus*.

Zoogeographical and Biogeographical Analysis of the Snakes of Jordan

The snake fauna of Jordan essentially originated from different elements. It consists of forms that are con-

sidered Palearctic, Oriental, Afro-tropical and Arabian. Endemism is known, but covers southern Lebanon, Palestine and Jordan rather than being restricted to Jordan. There are two relict species that are confined to isolated habitats, separated from their continuous range of distribution. Also, Jordan represents either the southern or northernmost distribution for several Arabian and Palearctic species. In this context, we will discuss the zoogeographical affinities of the snake fauna, endemism and the relict forms.

Distribution, constitution and abundance of the biota in the Mediterranean region are the product of long periods of alterations resulting from evolution, adaptation and migration (ROBINSON, 1982). The biogeographical complexity is a result of geological changes caused by plate tectonics, such as the connection between Africa and Eurasia, the formation of the Rift Valley and Red Sea, and the uplifting of the

Table 27. Comparison between *Pseudocerastes persicus* and *Pseudocerastes fieldi*.

Character	<i>P. persicus</i>				<i>P. fieldi</i>			
	A*	C	E	D	B*	C	D	F
Circum-orbital scales	16–21	13–23	–	13–23	14–18	14–18	14–18	15–17
Scale rows at midbody	22–25	23–24	23	23–24	21–22	21–22	21–23	21–22
Ventrals	146–158	144–158	148	144–158	127–142	134–138	134–138	134–138
Subcaudals	40–48	41–48	42–46	41–48	33–44	35–38	36–38	38
No. of scales between nasal and rostral	2	1–2	1–2	1–2	1	2	2	2
Supralabials	12–15	13	–	–	11–14	–	–	–
Infralabials	14–17	–	–	–	14–16	–	–	–
SV length (mm)	476–980	–	–	–	400–675	–	–	–
Tail length (mm)	63–120	–	–	–	48–85	–	–	–
Total length/tail (mm)	–	–	66–76	61–83	–	–	–	–
Number of scales separates the eye from upper labials	2–3	3	–	–	2–3	3	–	–
Number of scales at the tip of the horn	1	–	–	–	2	–	–	–
No. of crossbars on the body	34	–	–	–	25	–	–	–
No. of crossbars on the tail	9–11	–	–	–	6–8	–	–	–

A*: Specimens studied in the following museums: GM, NMW, SMF, ZSM, ZMB (Total number = 37).

B*: JUMR collection (Total number = 16). C. Source: GASPERETTI (1988). E. Source: ARNOLD & GALLAGHER (1977). D. Source: MARX & RABB (1965). F. Source: SCHMIDT (1930).

eastern plateau as well as climatic changes and the mode of distribution of various biotic components during the Neogene and Quaternary. Coexistence of species descended from different biogeographical realms can be seen everywhere in the Levant, which leads to extreme biogeographical heterogeneity.

KOSSWIG (1955) stated that there are difficulties in distinguishing natural biogeographic barriers within the Levant. TCHERNOV & YOM TOV (1988) also indicated that the Levantine region is a transitional zone between the Palaearctic and the Saharo-Arabian Desert belt with a complex mosaic patterns of distribution. The Eastern Mediterranean region has witnessed intensive geological events that are reflected in paleobiological effects (KOSSWIG, 1955; POR, 1975; TCHERNOV & YOM TOV, 1988).

The Levantine biota reflects the extremely dynamic periods of past biological events. The geographical location of the Levantine region meant that it acted as a changeable corridor and as a dynamic filter (POR, 1987). The Levantine Landbridge was coined by POR (1987), and he discussed its biogeographic significance and function in shaping the current fauna of the area.

Also, Wādī Ramm and southern Jordan act as a “biological filter”. Jordan forms the southern part of the Levant, where there is dramatic intermingling faunas. In this region, geomorphology, soil types and climatic variations have enabled these species, descended from different biogeographic realms, to find suitable habitats for their success in the Levant.

Moreover, the Levant encompasses dispersed glacial and tropical relicts with enclaves of archaic and newly arrived elements. There is neither a simple nor an abrupt transitional biotic gradient from east to west or from north to south, but rather a complex mosaic pattern of distribution (KOSSWIG, 1955; TCHERNOV & YOM-TOV, 1988).

The zoogeographical affinities of the reptiles of Palestine and Jordan have been discussed by WERNER (1987 & 1988). He concluded that the herpetofauna of Palestine is heterogeneous and most forms are Mediterranean or Saharo-Arabian. The zoogeography of the Arabian reptiles was outlined by several authors. ARNOLD (1987) stated the endemism is high reaching 55% of the total herpetofauna of the Arabian Peninsula. Furthermore, JOGER (1987) made a comparison on the zoogeographic affinities of the herpetofauna of southwestern Arabia and Somalia and adjacent areas.

Snake distribution according to their biogeographic biotopes

Although four main biogeographical regions are defined in Jordan, no natural boundaries exist between them. The eastern mountains join gradually to the east

as well as to the west (Jordan Valley) with the Irano-Turanian zone, and the latter joins with the Saharo-Arabian region. Equally, the extension of the Irano-Turanian into Syria and further north is not limited or interrupted by natural boundaries. Similarly, the Arabian element extending from the Arabian Peninsula is continuous and fades around mid-central Jordan. The only separation exists between the Wādī 'Araba system and eastern Jordan, consisting of the eastern mountain chain extending through the whole country from north to south, ending in Aqaba. We have one example of a sand dune inhabitant, known only from Wādī 'Araba and not found in the eastern part of the country, the Wedge-snouted Skink, *Sphenops sepsoides* (DISI & AMR, 1998).

Jordan appears to be one of the richest and most heterogeneous natural environments for reptiles in the temperate regions of the world. Snakes and lizards occupy specific habitats, which suit the environmental requirements of the species, within various biotopes of Jordan. Some species are adapted to live in the desert, with sparse vegetation, where the temperature is high and relative humidity is low. Others favour the Mediterranean biotope that is characterized by high rainfall, *terra rosa* type of soil and rich vegetation.

Mediterranean species

At least nine species of snakes are strictly confined to the Mediterranean biotopes, seven colubrids (*D. jugularis*, *H. nummifer*, *P. collaris*, *E. decemlineata*, *E. lineomaculata*, *M. insignitus*, and *R. melanocephalus*), one species of Family Typhlopidae (*T. vermicularis*) and one viperid (*D. palaestinae*). All these species are associated with forested areas (*Quercus calliprinos* and *Pinus halepensis*) or thick vegetation at high altitudes with a minimum annual rainfall of 400 mm. Although these species inhabit the Mediterranean biotope, they have different origins, the majority having Palaearctic affinities. The distribution of these species extends over the eastern mountains to the south near Džānā and Petra. Southern Jordan represents the southernmost distribution for almost all these species. Furthermore, some of these species can be found in narrow transitional zones that are in contact with the Irano-Turanian and the Mediterranean biotopes (*D. jugularis* and *M. insignitus*). Habitats of these species are similar to those known from the mountains of Syria, Lebanon, Palestine and southern Turkey, which link to the eastern mountains of Jordan. *Telescopus hoogstraali* was only found in Ash Shawbak Mountains, that are dominated by Mediterranean elements, while in Sinai and Palestine, it occurs in Irano-Turanian biotopes.

Irano-Turanian Species

The Irano-Turanian biotope surrounds the Mediterranean element, and is considered as a transitional zone between the Saharo-Arabian and the Mediterranean biotopes. The Irano-Turanian lacks defined species that could be considered inhabitants strictly of this biotope. For example, *T. simoni*, *L. macrorhynchus*, *E. jaculus*, *E. coronella*, *E. rothi*, and *T. nigriceps* are found in both the Mediterranean and the Irano-Turanian biotopes, and some may also occur in the Saharo-Arabian biotope (e. g. *P. schokari*). The only example that might satisfy the definition of an Irano-Turanian species is the False-horned Viper, *P. fieldi*. It was found in many localities within the range of the Irano-Turanian biotope, though it is also found within the Saharo-Arabian region of Jordan.

Saharo-Arabian Species

The Saharo-Arabian snakes in Jordan are represented by nine species (*L. macrorhynchus*, *E. jaculus*, *L. diadema*, *P. rogersi*, *R. moilensis*, *P. schokari*, *C. g. gasperettii* and *E. colorartus*). *Cerastes gasperettii* and *L. diadema* are considered here as strictly confined to the Saharo-Arabian part of eastern and southern Jordan. The Wādī 'Araba populations of *C. g. mendelssohni* inhabit similar areas of sand dunes in the eastern and southern deserts of Jordan.

Sudanian Penetration Biotope Species

Telescopus dhara, *Atractaspis engaddensis* and *C. g. mendelssohni* are the best examples of Afro-tropical species that are very much confined to the Jordan Valley, the Wādī 'Araba and Wādī Ramm. Also, both species of *Micrelaps* are more common in the Jordan Valley, avoiding extreme desert conditions of Wādī 'Araba with scattered records near the Irbid area.

Relict species

Three species are considered relicts on the basis of their restricted distribution in Jordan, disconnected by considerable distances from their common range of distribution. For example, Schmidt's Snake, *D. schmidtii*, is known from northern Syria and its distribution extends from the southern Caucasus, southern and eastern Turkey to northern Iran. Such relict populations resulted from the glacial retraction that occurred in the region (DISI, 2002), which left some habitats suitable to sustain the remnant populations. Similarly, the Levant Viper, *Macrovipera lebetina*,

Table 28. Status of snakes in Jordan: IUCN, local status and species endemic to the Levant.

Family/Species	IUCN Red List Category	Local Status	Endemic to the Levant
Family Typhlopidae			
<i>Typhlops vermicularis</i>	LC	C	
<i>Rhinotyphlops simonii</i>	LC	R	●
Family Leptotyphlopidae			
<i>Leptotyphlops macrorhynchus</i>	LC	R	
Family Boidae			
<i>Eryx jaculus</i>	LC	C	
Family Colubridae			
<i>Dolichophis jugularis</i>	LC	C	
<i>Dolichophis schmidtii</i>	LC	RL	
<i>Eirenis coronella</i>	LC	C	
<i>Eirenis coronelloides</i>	LC	C	
<i>Eirenis decemlineata</i>	LC	C	
<i>Eirenis lineomaculatus</i>	LC	C	●
<i>Eirenis rothii</i>	LC	C	
<i>Hemorrhois nummifer</i>	LC	C	
<i>Hemorrhois ravergieri</i>	LC	RL	
<i>Lytorhynchus diadema</i>	LC	R	
<i>Rhagerhis moilensis</i>	LC	C	
<i>Malpolon insignitus</i>	LC	C	
<i>Natrix tessellata</i>	LC	C	
<i>Platyceps collaris</i>	LC	C	
<i>Platyceps elegantissimus</i>	DD	R	●
<i>Platyceps rhodorachis</i>	LC	C	
<i>Platyceps rogersi</i>	LC	R	
<i>Platyceps sinai</i>	DD	R	●
<i>Psammophis schokari</i>	LC	C	
<i>Rhynchocalamus melanocephalus</i>	LC	C	
<i>Spalerosophis diadema</i>	LC	C	
<i>Telescopus dhara</i>	LC	C	
<i>Telescopus hoogstraali</i>	EN	R	●
<i>Telescopus nigriceps</i>	LC	C	
Family Atractaspididae			
<i>Atractaspis engaddensis</i>	LC	C	
<i>Micrelaps tchernovi</i>	?	R	●
<i>Micrelaps muelleri</i>	LC	C	●
Family Elapidae			
<i>Walterinnesia aegyptia</i>	LC	C	
Family Viperidae			
<i>Cerastes gasperettii</i>	LC	C	
<i>Echis coloratus</i>	LC	C	
<i>Macrovipera lebetina</i>	LC	RL	
<i>Pseudocerastes fieldi</i>	LC	C	
<i>Daboia palaestinae</i>	LC	C	

C: Common, LC: Least Concern, DD: Data Deficient, EN: Endangered, R: Rare, RL: Relict.

has a disjointed distribution, forming relict populations in Algeria and Tunisia, as well as Jordan, while Eastern Turkey to Pakistan represents its continuous distribution range. Also, *H. ravergieri* has a confined distribution in the eastern desert of Jordan. Its main

distribution extends across Syria, northwards to Turkey.

Some of the herpetofauna that thrived in these pluvial conditions of abundant moisture and vegetation may be relicts in Jordan. Several sites in Jordan

inhabited by relict populations originated from the Palaearctic realm: *H. ravergeri* and *D. schmidtii* (Dayr al Kahf, southern hills of Jabal al Arab); *Macrovipera lebetina obtusa* (Aṭ Ṭafīla). Genera such as *Eirenis*, *Natrix* and others may be relicts of the Pleistocene glacial and the late pluvial, and Jordan represents their normal southern outpost of continuous distribution.

Endemic species

In Jordan, endemism *per se* is not known, however, seven species are considered endemic to the Levant. For example, Simon's Blind Snake, *R. simoni* and *D. palaestinae*, are confined to Jordan, Palestine, Lebanon and Syria while the Mole Viper, *A. engaddensis* is so far known from Palestine, Jordan, Sinai and NW Arabia. *M. muelleri*, has a wider range of distribution extending along the Rift Valley and its periphery, reaching Latakia in the coastal regions of Syria. Evidently, both *M. muelleri* and *A. engaddensis* are of Afro-tropical origin that penetrated our area through the Rift Valley, and in the case of *M. muelleri* as far as the Orontes Basin. There are no natural boundaries between Jordan, Palestine and Syria, thus permitting these species to expand their distribution into suitable habitats. The newly described species, *Micrelaps tchernovi*, is known from the Jordan Valley and is thus considered endemic.

Two other species occur only in southern Jordan and Palestine, northern Arabia and Sinai; *P. elegantissimus* and *P. sinai*, should be considered as endemics for the region. Lastly, *T. hoogstraali* has a narrow range of distribution from Sinai, Palestine and southern Jordan, and is certainly endemic to this area.

Conservation status of snakes in Jordan

Conservation of snakes has not received much attention in the Middle East. WERNER *et al.* (1998) addressed herpetological research required for the conservation of reptiles. DODD (1987) listed 186 species and subspecies of snakes that require conservation and management. Species such as *N. tessellata* and *M. lebetina* were among those in need of conservation. He also identified threats affecting snakes, including habitat alteration or destruction, collection for leather, meat source, as pets, malicious killing and their rarity.

Of the 37 species and subspecies known to occur in Jordan, three species (Table 28) have been listed under the IUCN Red List (Cox *et al.*, 2006). *Platyceps elegantissimus* and *P. sinai* are considered as data deficient, while *T. hoogstraali* is endangered. However, the local status of the snakes of Jordan differs from that provided by the IUCN list. This is based on our observations for the past 25 years on the abundance and number of collected materials over the years. For example, *R. simoni*, *L. macrorhynchus*, *L. diadema* and *P. rogersi* are becoming rare with the least number of collected specimens. Other species have very narrow distribution range and are considered as relicts (*D. schmidtii*, *H. ravergeri* and *M. lebetina*) that require immediate conservation efforts.

In this regard, we can only speculate on the threats affecting the snakes in Jordan, without giving quantitative data to confirm our conclusions. Some snakes such as *N. tessellata* are affected by the destruction of natural habitats by altering water courses. We have recorded about five populations of this snake that have been entirely extirpated from their natural habitats within the past 20 years. In Petra area, *L. macrorhynchus* is becoming rare, perhaps due to extensive use of this site by tourists and massive changes in the habitats. In many parts of Wādī 'Araba, Wādī Ramm and the eastern desert, intensive agriculture is taking its toll in changing sand dunes that serve as the main habitat for sand-dwelling species such as *L. diadema*, leading to an obvious decrease in its population.

Conversely, other snakes are becoming more common than previously. For example, *D. jugularis*, *D. palaestinae* and *M. insignitus* are among the most common snakes in agricultural areas in northern Jordan, especially around chicken farms where grains are stored providing for an abundance of rodents. Similarly, *W. aegyptia* and *R. moilensis* are common in the eastern desert, especially around new settlements, where rodent and toad populations are relatively high.

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Annex 1. List of localities indicated in the text and their coordinates.

Locality	N	E
‘Ai	31° 08' 00"	35° 38' 27"
‘Ammān	31° 58' 00"	35° 59' 00"
‘Anjara	32° 18' 25"	35° 45' 13"
‘Aqaba	29° 31' 36"	35° 00' 28"
‘Aymah	30° 54' 00"	35° 33' 00"
‘Ayn Ghazāl	31° 42' 00"	35° 37' 00"
‘Ayn Laḥz,ah	30° 42' 00"	35° 36' 00"
‘Ibbīn	32° 22' 00"	35° 49' 00"
‘Īrā	31° 59' 40"	35° 40' 04"
Abū al Lasan	30° 03' 00"	35° 30' 00"
Abū Nuṣayr	32° 05' 00"	35° 52' 00"
Ad Dīsah	29° 39' 13"	35° 30' 52"
Ader	31° 12' 00"	35° 46' 00"
Afnā	32° 23' 00"	35° 49' 00"
Aidūn	32° 30' 26"	35° 51' 27"

Annex 1. Continuation.

Locality	N	E
Ajlūn	32° 20' 02''	35° 45' 03''
Ajlūn Nature Reserve	32° 22' 49''	35° 45' 49''
Al 'Adasiyah	32° 39' 54''	35° 36' 47''
Al 'Ālūk	32° 10' 00''	35° 55' 00''
al 'Umarī	31° 41' 46''	36° 57' 42''
Al Adnanehya	31° 05' 58''	35° 41' 41''
Al Baq'ah	32° 04' 00''	35° 51' 00''
Al Batheyah	31° 28' 45''	35° 47' 57''
Al Birkatayn	32° 18' 00''	35° 54' 00''
al Bustānah Reserve	32° 57' 40''	38° 47' 49''
Al Fujayj	30° 33' 12''	35° 40' 44''
Al Ḥarīr	30° 47' 00''	35° 41' 00''
al Ḥaṣāh	30° 49' 36''	35° 58' 36''
Al Hawāya	31° 39' 58''	35° 39' 27''
Al Hazīm	31° 35' 03''	37° 12' 40''
Al Ḥiṣn	32° 29' 16''	35° 52' 48''
Al Ḥummar	32° 01' 00''	35° 49' 00''
Al Jafr	30° 17' 36''	36° 12' 50''
Al Jubayhah	32° 01' 00''	35° 52' 00''
Al Kamālīyah	32° 03' 00''	35° 48' 00''
Al Karak	31° 11' 05''	35° 42' 17''
Al Khaldeyeh	32° 07' 10''	36° 15' 50''
Al La'bān	30° 55' 00''	35° 42' 00''
Al Mafrāq	32° 21' 00''	36° 12' 00''
Al Maqtas	31° 47' 56''	35° 33' 04''
Al Mashara'	32° 31' 34''	35° 36' 07''
Al Mazār	30° 58' 38''	35° 51' 32''
Al Mazār Al Shamali	32° 28' 21''	35° 47' 34''
Al Mudawwarah	29° 18' 59''	36° 01' 31''
Al Muraygha	30° 05' 11''	35° 31' 03''
Al Muwaqqar	31° 48' 56''	36° 05' 39''
Al Qaṭrānah	31° 14' 51''	36° 03' 11''
Al Qunayṭirah	31° 40' 00''	36° 04' 00''
Al Shajarah	32° 39' 00''	35° 56' 00''
Al Useikhim	31° 57' 03''	36° 57' 18''
Al Waseyah	31° 07' 16''	35° 41' 28''
Al Yadodah	31° 51' 24''	35° 53' 45''
Al-Hisha al-Beda	30° 55' 58''	35° 24' 44''
Aqrabā	31° 28' 00''	35° 48' 00''
Ar Rabbah	31° 16' 13''	35° 44' 19''
Ar Rājif	30° 11' 28''	35° 26' 32''
Ar Ramthā.	32° 33' 33''	36° 00' 25''
Ar Rīshah	30° 13' 40''	35° 12' 59''
Ar Ruṣayfah	32° 01' 00''	36° 03' 00''
Ar Ruwayshid	32° 30' 00''	38° 12' 00''
As Salt	32° 02' 21''	35° 43' 38''
Aṣ Ṣarīḥ	32° 30' 00''	35° 54' 00''
As Sulaykhāt	32° 19' 51''	35° 36' 05''
Ash Shawbak	30° 31' 12''	35° 32' 18''
Ash Shūnah ash Shamālīyah	32° 36' 23''	35° 36' 44''
Aṭ Ṭafīla	30° 50' 00''	35° 36' 00''
Aṭ Ṭayyibah	31° 03' 21''	35° 36' 05''
Awjān	32° 02' 00''	36° 05' 00''
Ayl	30° 13' 00''	35° 32' 00''

Annex 1. Continuation.

Locality	N	E
Az Zarqā'	32° 05' 00"	36° 06' 00"
az Zarqā' River	32° 06' 56"	35° 32' 30"
Azraq	31° 50' 00"	36° 49' 00"
Azraq ash Shīshān	31° 50' 00"	36° 49' 00"
Azraq Wetland Reserve	31° 53' 30"	36° 49' 00"
Barashtā	32° 40' 00"	35° 53' 00"
Basta	30° 13' 37"	35° 32' 02"
Batīr	31° 15' 51"	35° 42' 17"
Bāyir	30° 45' 50"	36° 40' 46"
Bequwyeh	32° 05' 07"	37° 04' 35"
Bīr Madhkūr	30° 24' 00"	35° 21' 00"
Birqish	32° 22' 56"	35° 46' 24"
Buqay'awiyah	30° 38' 03"	35° 23' 27"
Burmā	32° 13' 12"	35° 46' 52"
Bushrā	32° 33' 00"	35° 54' 00"
Dābūq	31° 59' 00"	35° 49' 00"
Ḍānā	30° 40' 32"	35° 36' 34"
Ḍānā Nature Reserve	30° 40' 02"	35° 34' 30"
Dayr 'Allā	32° 11' 52"	35° 37' 16"
Dayr Abū Sa'īd	32° 30' 00"	35° 41' 00"
Dayr al Kahf	32° 17' 00"	36° 50' 00"
Dead Sea	31° 31' 40"	35° 33' 49"
Deheibe el Gharbiye	31° 47' 36"	36° 01' 33"
Dhaba'ah	31° 33' 00"	36° 02' 59"
Dhahel	30° 55' 52"	35° 23' 41"
Dibbīn Nature Reserve	32° 15' 00"	35° 49' 00"
Dilāghah	30° 08' 00"	35° 24' 00"
Disah	29° 39' 07"	35° 30' 45"
El 'Aina	30° 58' 02"	35° 46' 21"
El Aritein	32° 07' 00"	36° 58' 00"
El Ghoweir	31° 08' 00"	35° 45' 00"
El Hamma	32° 28' 00"	35° 36' 00"
El Hummar	32° 01' 00"	35° 49' 00"
El Huseiniya	31° 01' 39"	35° 43' 26"
El Judaiyida	31° 32' 12"	35° 39' 02"
El Karāma	31° 57' 08"	35° 34' 45"
El Muqābalein	31° 54' 00"	35° 54' 00"
El Nageh	31° 02' 00"	35° 29' 00"
El Qa'	30° 16' 55"	35° 32' 41"
El Quweira	29° 48' 00"	35° 19' 00"
El Zemaliye	32° 30' 00"	35° 36' 00"
El-Shehabieh	31° 10' 39"	35° 41' 13"
Enbah	32° 28' 20"	35° 45' 31"
Faqqū'	31° 22' 08"	35° 41' 58"
Fuḥeiṣ	32° 00' 39"	35° 46' 00"
Gharandal	30° 04' 43"	35° 12' 53"
Ghawr al Hadīthah	31° 18' 14"	35° 31' 38"
Ghawr Al Wasat	31° 49' 00"	35° 35' 00"
Ghawr aṣ Ṣāfi	31° 02' 00"	35° 28' 00"
Ḥabaka	32° 28' 00"	35° 51' 00"
Hām	32° 31' 00"	35° 49' 00"
Ḥartā	32° 41' 38"	35° 50' 46"
Hashemia	32° 05' 11"	36° 06' 49"
Ḥātim	32° 38' 43"	35° 46' 42"

Annex 1. Continuation.

Locality	N	E
Hawwāra	32° 32' 01''	35° 54' 28''
Hisbān	31° 48' 00''	35° 48' 00''
Homrat Al Sahen	31° 58' 00''	35° 37' 00''
Humrat Mā'in	31° 40' 06''	35° 36' 16''
Irbid	32° 33' 20''	35° 51' 00''
Jabal al Ashāqif	32° 14' 00''	37° 37' 00''
Jabal Mas'ūdah	30° 10' 00''	35° 21' 00''
Jad'a	31° 23' 00''	35° 45' 00''
Jarash	32° 16' 50''	35° 53' 43''
Jāwā	32° 20' 00''	37° 02' 00''
Jerisha	32° 10' 04''	35° 43' 43''
Jinnīn aş Şafā	32° 31' 00''	35° 42' 00''
Jiraish	32° 06' 00''	35° 43' 00''
Jīza	31° 42' 00''	35° 57' 00''
Jordan River	32° 13' 27''	35° 33' 54''
Kafr al Mā'	32° 29' 04''	35° 41' 48''
Kafr Asad	32° 36' 00''	35° 43' 00''
Kafr Khal	32° 21' 34''	35° 52' 52''
Kathrabbā	31° 08' 18''	35° 37' 24''
Khaw	32° 06' 00''	36° 10' 00''
Khelda	32° 00' 00''	35° 51' 00''
King Husayn Bridge	31° 52' 00''	35° 32' 00''
King Talal Dam	32° 11' 24''	35° 49' 21''
Kufrinja	32° 17' 50''	35° 42' 11''
Kuraymah	32° 16' 45''	35° 35' 52''
Ma'ān	30° 12' 00''	35° 44' 00''
Mā'in	31° 40' 49''	35° 44' 02''
Mādabā	31° 43' 00''	35° 48' 00''
Māhiş	31° 59' 00''	35° 46' 00''
Mamoneyeh	31° 10' 34''	35° 44' 11''
Marsa'	32° 08' 16''	35° 52' 05''
Marw	32° 37' 00''	35° 53' 00''
Mekawer	31° 34' 00''	35° 38' 00''
Melka	32° 40' 28''	35° 45' 08''
Methla Station	29° 50' 54''	35° 06' 42''
Miḥnā	32° 22' 00''	35° 45' 00''
Mu'tah	31° 05' 33''	35° 41' 40''
Nā'ūr	31° 53' 00''	35° 50' 00''
Nakhl	31° 04' 00''	35° 47' 00''
Petra	31° 07' 00''	35° 47' 00''
Qā' as Sa'dīyīn	30° 09' 00''	35° 11' 27''
Qaşr 'Amra	31° 48' 16''	36° 35' 08''
Qaşr al Ḥallābāt	32° 06' 00''	36° 20' 00''
Qaşr Burqu'	32° 37' 00''	37° 58' 00''
Ra's an Naqb	29° 54' 00''	35° 32' 00''
Raḥmah	29° 55' 00''	35° 08' 00''
Rākīn	31° 13' 26''	35° 42' 24''
Riḥāb	32° 19' 00''	36° 06' 00''
Rihābā	32° 26' 13''	35° 47' 02''
Rujm ash Shīd	31° 32' 17''	36° 20' 18''
Safawi	32° 12' 00''	37° 07' 00''
Şafūṭ	32° 02' 00''	35° 50' 00''
Şaḥāb	31° 52' 43''	36° 00' 16''
Sail El 'Aina	30° 59' 49''	35° 43' 02''

Annex 1. Continuation.

Locality	N	E
Şakhrāh	32° 22' 11"	35° 50' 42"
Salihī	32° 07' 22"	35° 49' 52"
Samā Al Rousan	32° 28' 00"	36° 14' 00"
Shafa Badran	32° 03' 40"	35° 55' 10"
Shaikh Hussain	32° 29' 50"	35° 35' 16"
Shawmarī Wildlife Reserve	31° 45' 00"	36° 43' 00"
Shubaika	32° 29' 00"	37° 15' 00"
Sūf	32° 19' 03"	35° 50' 08"
Sukhna	32° 08' 00"	36° 04' 00"
Şurra	32° 24' 00"	36° 09' 00"
Şuwayliḥ	32° 01' 30"	35° 50' 17"
Tabarbor	32° 00' 11"	35° 56' 50"
Tal'at ar Ruzz	32° 10' 00"	35° 52' 00"
Thaḡhrat Asfoor	32° 19' 39"	35° 55' 02"
Um Al Basateen	31° 49' 00"	35° 52' 00"
Um Al Ḥiran	31° 51' 32"	36° 01' 42"
Um Qeis	32° 39' 18"	35° 41' 01"
Umm Al Ḍānānir	32° 05' 00"	35° 49' 00"
Umm al Qiṭṭayn,	32° 19' 00"	36° 38' 00"
Wādī ad Dulayl	30° 51' 00"	35° 54' 00"
Wādī al Ḥasā	30° 51' 00"	35° 54' 00"
Wādī al Qaṭṭāfī	31° 42' 12"	37° 15' 40"
Wādī al Yābis	31° 11' 00"	35° 55' 00"
Wadi Al-Hussynehych	30° 35' 05"	35° 42' 44"
Wādī Al-Mujjib	31° 27' 49"	35° 34' 32"
Wādī 'Araba	30° 23' 59"	35° 10' 02"
Wādī as Sīr	31° 57' 00"	35° 49' 00"
Wādī ash Shuqayq	31° 30' 41"	35° 42' 49"
Wādī Dhahal	30° 45' 02"	35° 20' 59"
Wadi El-Shamyeh	30° 12' 32 "	35° 44' 19"
Wādī Faynān	30° 37' 32"	35° 26' 43"
Wādī Fidān	30° 40' 20"	35° 22' 41"
Wādī Ibn Hammad	31° 17' 31"	35° 31' 07"
Wādī Khuneizīra	30° 53' 00"	35° 26' 04"
Wādī Kufrinja	32° 16' 25"	35° 33' 42"
Wādī Mūsá	30° 19' 20"	35° 28' 46"
Wādī Ramm	30° 53' 00"	35° 26' 04"
Wādī Sha'eb	31° 55' 09"	35° 38' 35"
Yājūz	32° 02' 00"	35° 55' 00"
Zabdah	32° 33' 00"	35° 50' 00"
Zaḡar	32° 34' 00"	35° 46' 39"
Zahum	31° 10' 00"	35° 46' 00"
Zūbiyā	32° 26' 00"	35° 46' 00"