

# A contribution to *Spalerosophis microlepis* JAN, 1865, with a short review of the genus and a key to the species (Squamata: Serpentes: Colubridae)

Ein Beitrag zu *Spalerosophis microlepis* JAN, 1865  
mit einem kurzen Überblick zur Gattung  
und einem Bestimmungsschlüssel der Arten  
(Squamata: Serpentes: Colubridae)

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## KURZFASSUNG

Die vorliegende Arbeit behandelt Morphologie und Verbreitung von *Spalerosophis microlepis* JAN, 1865, einer endemischen Colubride aus dem Westen des Iran. *Spalerosophis* JAN (Typusart *S. microlepis*) umfaßt mindestens sechs Arten vom westlichen Sahel und dem Horn von Afrika bis zum Himalaya und Zentralasien. Äußere Diagnosemerkmale der Gattung werden geprüft und ein Bestimmungsschlüssel für die berücksichtigten Taxa präsentiert. Die richtige Schreibweise und Autorenschaft von *Periops parallelus schirasianus* JAN, 1863 wird klargestellt und die Validität dieses Taxons in Betracht gezogen. Ferner sprechen die Verfasser die Verbreitungsgrenze gewisser Arten und die heikle Rassengliederung von *S. diadema* (SCHLEGEL, 1837) an und erläutern taxonomische Probleme im Zusammenhang mit dessen Typuslokalität.

## ABSTRACT

The morphology and distribution of *Spalerosophis microlepis* JAN, 1865, an endemic colubrid from West Iran, is assessed. *Spalerosophis* JAN (type species *S. microlepis*) is made up of at least six species from the western Sahel and the Horn of Africa to the Himalayas and Central Asia. External diagnostic characters of this genus are analyzed and a determination key for recognized taxa is presented. The correct spelling and authorship of *Periops parallelus schirasianus* JAN, 1863 is clarified and the validity of this taxon considered. The authors also address the distribution limits of certain species and the awkward subspecific classification of *S. diadema* (SCHLEGEL, 1837) and debate taxonomic problems in context with its type locality.

## KEY WORDS

Reptilia: Squamata: Serpentes: Colubridae; *Spalerosophis* JAN, *Spalerosophis microlepis* JAN, type species, altitudinal range, *Spalerosophis* spp., taxonomy, morphology, distribution, determination key

## INTRODUCTION

*Spalerosophis* JAN, 1865 was established as a monotypic genus for *S. microlepis* from western Iran. BOULENGER (1892, 1893) synonymized *Spalerosophis* JAN with *Zamenis* auct. SCHMIDT (1930) revalidated the genus for three species including the Saharo-Sindian *S. diadema* (SCHLEGEL, 1837) and *S. arenarius* (BOULENGER, 1890), then only known on the basis of a single

entire, and two incomplete specimens from Sind (Pakistan) and the Rajputana Desert in Northwest India.

Since *Spalerosophis microlepis* JAN is rare in scientific collections, MARX (1959) had only two specimens at hand for his revision of the genus. To date, the number of *Spalerosophis* spp. has doubled from three to six (LANZA 1964; MIN-

TON 1966; PASTEUR 1967; BAIG & MASROOR 2008). This study presents an update of morphological and distribution data for *S. microlepis*, a review of the pertinent early lit-

erature related to taxonomic matters of *Spalerosophis* spp., a revised description of scale features within the genus, and a determination key for currently recognized taxa.

## MATERIALS AND TERMINOLOGY

Morphological data are available for six *S. microlepis* deposited in The Natural History Museum [British Museum (Natural History)], London (BMNH), Field Museum of Natural History, Chicago (FMNH), Muséum d'Histoire naturelle, Genève (MHNG), and the National Museum of Natural History [United States National Museum (Smithsonian Institution)], Washington (USNM). The specimens are: BMNH 1920.3.20.5 ("Shiraz", Fars, ca. 29°37'N / 52°32'E, ca. 1520 m above sea level, subad. ♀, coll. Maj. J. E. B. HOTSON; badly damaged, no body scale data ascertained), FMNH 20923 and 20929 ("Persepolis" [Takht-e Jamshid], Fars, 29°56'N / 52°53'E, ca. 1620 m a.s.l., ♂♂), MHNG 2626.70 (Mehkuyeh [Mehkuyeh-ye Sofla], Fars, 29°01'N / 52°29'E, ca. 1650 m a.s.l., subad. ♀), MHNG 2646.64 (Lama [Lemah], Boyer Ahmadi-ye Sardsir-ve Kohkiluyeh, 31°03'N / 51°13'E, ca. 1570 m a.s.l., subad. ♀), and USNM 153749 (18 km S Masjed Soleyman, Khuzeestan, 31°50'N / 49° 18'E [TUCK 1971], ca. 300 m a.s.l., subad. ♂).

Further acronyms used in the text are BNHM (Bombay Natural History Museum, Mumbai), MSNM (Museo Civico di Storia Naturale, Milano), MRSN (Museo Regionale di Scienze Naturali, Torino), MZUF (Museo Zoologico dell'Università ['La Specola'], Firenze), and MZUT (Museo ed Istituto di Zoologia Sistemica della Università, Torino).

'Supranumeral dorsal head scales' denote all those scales besides the nine typical colubrine scutes on the pileus (excluding rostral). Perioculars are all scales in contact with the eye except the supraocular (preoculars, suboculars, and postoculars auct.); this term explicitly includes distinctly larger scales (particularly those in the upper preocular area) and any intermittent granule entering the orbit as well. Loreals are situated on or above a straight line parallel to the mouth from the lower posterior

tip of the nasal to the periocular ring. Scales below this demarcation and in contact with the supralabials are anterior 'secondary labials'. Smaller scales usually present in the loreal-preocular area that do not fit with one of these definitions are referred to as 'supplementary scales'. The internasal-prefrontal length is the distance along the midline from the posterior border of the rostral to the anterior border of the frontal; the length of the parietals is defined as the length of their median suture; the distance of the nostril to the anterior edge of the eye is measured from the posterior border of the orifice along the shortest straight line. Further terminology is explained in the text.

Due to the limited preserved material available, relevant morphological data for *S. microlepis* from literature (JAN 1865; JAN & SORDELLI 1867; WERNER 1895; WALL 1908; KRAMER & SCHNURRENBERGER 1963) are considered in the results section. Information used for the elaboration of the brief generic description (see Characters and Comments) and the determination key includes data from WALL (1908), MARX (1959), LANZA (1964), MINTON (1966), PASTEUR (1967), LANZA (1978), and BAIG & MASROOR (2008). We applied great caution when using these partly unverified figures; doubtful values and indications are discussed at the appropriate place. Comparative material examined for the preparation of this study includes, for example, the paratype (MZUF 2634) and two subadult specimens (MZUF 6061-62) of the rare *S. josephscortecii* LANZA, 1964.

The *Spalerosophis diadema* group is composed of the name bearing species as well as *S. arenarius* (BOULENGER, 1890), *S. atriceps* (FISCHER, 1885), and *S. dolichopilus* (WERNER, 1923). This ad hoc term is purely technical and does not necessarily imply closer phylogenetic relationships vis-à-vis *S. josephscortecii* and *S. microlepis*.

## GENERIC ACCOUNT

*Spalerosophis* JAN, 1865  
Diadem or Royal Snakes

*Chilolepis* FITZINGER, 1843: 26 - type species by original designation: *Coluber cliffordii* SCHLEGEL, 1837 [*Spalerosophis diadema cliffordii*].

*Spalerosophis* JAN, 1865: 356 - type species by monotypy: *Sphalerosophis* [sic] *microlepis*.

*Loxodon* [*microlepis*] SORDELLI in JAN & SORDELLI, 1867: pl. 20.III (nomen novum, non *Loxodon* MÜLLER & HENLE, 1838).

*Toxodon* [*microlepis*]. - SORDELLI in JAN & SORDELLI 1867: 2 (lapsus calami, non *Toxodon* OWEN, 1837); SORDELLI in JAN & SORDELLI 1881: 18 ('Table alphabétique des espèces').

*Spalerosophis* [sic]. - COPE 1886: 491 (see Taxonomy: smallprint).

*Spelaerosophis* [sic]. - LOVERIDGE 1957: XXI (in error for *Spalerosophis* JAN, see *S. microlepis*).

## Taxonomy

*Chilolepis* FITZINGER, 1843 (see, e.g., COPE 1886; LOVERIDGE 1957: 257, footnote 114) was suppressed under the plenary powers (ICZN 1966) and placed on the Official Index of Rejected and Invalid Generic Names in Zoology (No. 1892). The same ruling declared *Sphalerosophis* (Name No. 1893) an incorrect original spelling of *Spalerosophis* JAN, 1865 ("by the action of MARX, 1959, as first reviser") that was "placed on the Official List of Generic Names in Zoology with the Name Number 1741." The gender is masculine.

The compulsory orthography irritates orthodox linguistic scholars because only σφαλερός (*sphaleros*), meaning slithery, deceitful, or dangerous, exists in Classic Greek, but not the word σπαλερός (*spaleros*). Moreover, the composite noun *Sphalerosophis*, or *Spalerosophis* as in COPE (1886), would philologically be correct. WILLIAMS & WALLACH (1989) cite further examples of erroneous spelling (i.e., *Spalersophis*, *Sphaerosophis*) with their respective reference; MAJUPURIA'S (1982) *Spalerosophis* [sic] in the caption to a figure inserted between pp. 168-169 refers to a photograph of *Xenochrophis* sp.

The nomen novum *Loxodon* SORDELLI in JAN & SORDELLI, 1867 (for *Spalerosophis*

JAN, 1865) as well as *Toxodon* SORDELLI in JAN & SORDELLI 1867, a slip of the pen, are preoccupied (BLANFORD 1876; WILLIAMS & WALLACH 1989). The substitute name alludes to the conspicuously arcuate maxillary teeth (see Morphology).

We are not aware of any published reference to prompt the introduction of a replacement name as insinuated by BLANFORD (1876) who stated that "*Loxodon* appears to be a generic name invented by Professor JAN [...] because *Sphalerosophis* [sic] had been objected to." At any rate, GÜNTHER (1866) merely mentioned JAN'S (1865) new genus, though with an exclamation mark [*"Spalerosophis* (!)"], and gave a brief diagnosis of the type species. We interpret this punctuation as an indication to the different orthographies of the generic name in JAN (1865); the one used by GÜNTHER (1866) is the correct original spelling (see above). Regarding the new names proposed, GÜNTHER (1868: 126) laconically observed that "The snake figured under the name *Toxodon* or *Loxodon microlepis* is an interesting addition to ophiology; formerly it was described as *Spalerosophis*".

KRAMER & SCHNURRENBERGER (1963) erroneously considered the substitute name *Loxodon* a lapsus calami ("Schreibfehler") of the illustrator Ferdinando SORDELLI. WILLIAMS & WALLACH (1989) credited "JAN 1867" with *Toxodon* ("error = *Loxodon*"), i.e., the orthography introduced in the table of contents ('Index des Planches'). This text ("*Toxodon microlepis* Jan" [...]) and the plate set containing the illustrations of "*Loxodon microlepis*" (livraison 20) published in "Février 1867" were issued after the passing away of Giorgio (or Georg, Georges) JAN on May 8, 1866. Therefore, we follow ADLER (1989) and attribute all incorrect spelling of names in JAN & SORDELLI (1866-1881) including, for instance, *Toxodon* or *Periops parallelus* var. *schirazana* [sic] (1867: pl. 20.II, see Systematics and Distribution: last smallprint) to the illustrator F. SORDELLI who eventually finished and published the second and third volumes of the monumental 'Iconographie générale des ophiidiens'.

To be precise, "*Toxodon*" was first mentioned in the legend printed on the inside cover of JAN & SOR-

DELLI (1867), i.e., published at the very same moment as the plates themselves. These explanations were supplied with each part (livraison) of JAN & SORDELLI (1860-1881) as stated by WILLIAMS & WALLACH (1989) and evident from the complete set of the 'Iconographie' in the Ernst Mayr Library at Harvard University (Cambridge, Massachusetts) accessible on the internet under: <http://www.archive.org/search.php?query=Jan%20Sordelli>. However, the final version of the 'Index des Planches' accompanying the second volume was published at the earliest with the last part (livraison 34). It was this 'Index' which GÜNTHER (1867) alluded to when he noted that, for example, the text to livraison 18 (first part of second volume) issued in "Octobre 1866" (as well as the last three parts of the first volume) had not yet been in the library of the former 'British Museum (Natural History)' by the end of that year.

### Systematics and Distribution

Six species are currently recognized (BAIG & MASROOR 2008), i.e., *S. arenarius* (BOULENGER) and *S. atriceps* (FISCHER) from North India and Pakistan, *S. diadema* (SCHLEGEL) from the western Sahel and Sudan to Central Asia (Kyrgyzstan: Fergana Valley) and Northwest India, *S. dolichospilus* (WERNER) from the Maghreb, *S. josephscortecii* LANZA only known from Galgalo Oasis in Northwest Somalia (Puntland), and the type species *S. microlepis* found in West Iran (Zagros Range). *Spalerosophis diadema* is polytypic including *S. d. cliffordii* (SCHLEGEL, 1837) from Mauritania to Southeast Turkey and Khuzestan (Iran).

Contrary to MARX (1959), MERTENS (1969) or KHAN (2004, 2006), we adhere to the view held by MINTON (1966) and BAIG & MASROOR (2008) and consider *Zamenis diadema* ["Var."] *atriceps* FISCHER a species distinct from *Coluber diadema* SCHLEGEL. KHALAF (1959, 1960) and LATIFI (1991) followed SCHMIDT (1939) who considered *Coluber cliffordii* SCHLEGEL a valid species. *Spalerosophis cliffordii* [sic] in FRANZEN (1999: 33) or OLIVEIRA SERAPICOS & BERNARDINO MERUSSE (2006: 193) is unintentional as evidenced by trinomial citations in the remaining text. TRAPE & MANÉ (2006) conferred specific rank to *cliffordii* [sic], but no rationale for this attitude is given.

Whereas adult *S. atriceps* and *S. diadema* show "strikingly different" (MARX 1959) head and dorsal color patterns, this distinctive feature does not hold for juveniles and half-grown specimens, thus making their identification difficult. Sympatry of *S. atriceps* and *S. diadema* is confirmed for Pakistan (e.g., MINTON 1966;

MERTENS 1969). The former extends to Northwest India, but the eastern distribution limit of *diadema* is contested. WALL (1914) mentioned Diadem Snakes (*atriceps* or *diadema*) from Uttar Pradesh (Allahabad, Fatehgarh), and MINTON (1966) cited *atriceps* east to "Allahabad, Uttar Pradesh" (the alleged presence in "Gilgit", Pakistan, is doubtful; see Characters and Comments). This species is also reported "from the Central Terai" (Chitwan) as well as Kathmandu (autochthonous?) and Saptari Districts, Nepal (GRUBER 2002; SHAH & TIWARI 2004: 191, map); an earlier herpetological survey in the Chitwan National Park (e.g., ZUG & MITCHELL 1995) could not produce evidence of the presence of *atriceps*. MINTON (1966) reported *diadema* from "northern Rajasthan, and the western part of the United Provinces." This species appears in WHITAKER & CAPTAIN'S (2004: 22) checklist of Indian snakes but lacks in the descriptive part (*atriceps* is mapped east to Rajasthan and Himachal Pradesh). WALLACH'S (2007: 63) report of *diadema* from Nepal relies on MISHRA & MAJUPURIA (1979) and is based on a bicephalic *Xenochrophis* sp. ["*piscator*"] (MISHRA & SHAH 1983). BAIG & MASROOR (2008: 114, fig. 7) only indicate *atriceps* for India and state that "The nominate form itself does not exist in India and adjacent areas of Oriental Pakistan called as Cholistan Desert." We are close to convinced that *S. diadema* occurs in Northwest India (e.g., Kashmir) but infer from a brief review of the pertinent literature that this topic requires serious investigations.

SCHLEGEL (1837) described *Col.[uber] diadema* after RUSSELL'S (1807) text and illustration, mentioned two syntypes ("220 ou 238 plaques abdominales"), and erroneously reported the species from the vicinity of Mumbai ("pris dans les environs de Bombay"). RUSSELL (1807) noted "Two specimens in good preservation" and clearly stated that they "were received from Dr. Scott, of Bombay, sent to him from Buchier, by Mr. Bruce." The smaller individual was described and figured as evidenced by the ventral count and the fact that the illustration (RUSSELL 1807: pl. XXX) undoubtedly shows a male. MERTENS (1940) referred to this specimen as the "Typus von *diadema*" or "*diadema*-Typus" and this constitutes a valid lectotype designation (ICZN 1999: art. 74.5). The larger paralectotype with 238 ventrals ("abdominal scuta", subcaudals unknown) is, most probably, a female.

Part of Patrick RUSSELL'S specimens is deposited in the BMNH collection as, for instance, recently demonstrated for DAUDIN'S (1803) *Coluber* [= *Dryocalamus*] *nympha* (KUCCHARZEWSKI & TILLACK 2008). However, this is not the case with the type material of *C. diadema* SCHLEGEL as evidenced by the list of holdings in BOULENGER (1893), and it may be lost.

The supposed type locality of *Spalerosophis d. diadema* (Bushehr) is less than 400 km airline from the distribution limits of *S. d. cliffordii* which encroaches extreme



Southwest Iran (Khuzestan, Ahvaz: USNM 121592) according to MARX (1959: 353, map). He separated these forms on the basis of the number of subcaudals, i.e., 80 or more in the nominate subspecies versus less than 80 in *cliffordii* (see Key). An unsexed juvenile *S. d. diadema* from the vicinity of Bushehr reported by SCHMIDT (1955) has 228 ventrals and 87 subcaudals. RUSSELL (1807) gave 220 ventrals and 61 “Squamae Subcaudales” for the male lectotype of *Cobuber diadema* SCHLEGEL showing an apparently complete tip of the tail (RUSSELL 1807: pl. XXX). Thus, applying MARX’ (1959) criterion for subspecific distinction, at least one of two original specimens would definitely not pass as the nominate race due to its extremely low number of subcaudals, but, paradoxically, fits with the diagnosis of *S. d. cliffordii* [sic] sensu MARX (1959) as correctly insinuated by LANZA (1964) some time ago (SCHÄTTI et al. 2009). We refrain from taxonomic consequences, await further fieldwork in the northern Persian Gulf area, and follow conventional usage of subspecific names within *S. diadema* (see Key).

*P.[eriops] parallelus* [var.] *schiraziana* JAN, 1863 is the original, and thus correct, spelling and dating; the feminine form is in accordance with the gender of the Latin word “varietas”. Modern authors using the specific or subspecific name *schirasianus* erroneously adopted JAN’s (1865) unjustified emendation *P. parallelus* [sic] *Schiraziana* [sic] and considered this account to be the original description of the taxon.

#### Characters and Comments

Prefrontals usually broken up into three or more shields; loreal fragmented (usually three or more scales); 10-17 supralabials; eye separated from the supralabials by subocular scales, 6-15 perioculars; temporals usually numerous, normally four or more in first row; 202-256 (minimum from BARAN 1982, “278” fide BOULENGER 1893 see comment below) ventrals, 62-114 paired subcaudals (largely from MARX 1959; MINTON 1966; BAIG & MASROOR 2008); anal scute mostly entire except in *S. josephscorteccii*; dorsals smooth or keeled, in 25 (rarely 23) to 45 longitudinal rows at mid-body.

Without the opportunity to verify the identification of the specimens, we do not take into account, for example, three out of four “*Zamenis diadema* Schleg.” from Sind

“which have not the characteristic row of scales under the eye” as reported by HUBRECHT (1882). The maximum number of “scales in ocular ring” (15) in MARX (1959: tb. 1) is based on *S. microlepis* and was obtained through a counting system not compatible with our definition of perioculars (see Materials and Terminology, Morphology: second smallprint). The highest value (15) is from *S. josephscorteccii* (LANZA 1978). Few anterior temporals (i.e., only 2 or 3 in first row) are reported, for instance, in *S. diadema* ssp. and *S. arenarius* (see Discussion).

The generic diagnosis in LEVITON et al. (1992) leaves to be desired. The number of scales (“20-25”) on the “Anterior [sic] top of head [...] in place of internasals, prefrontals, frontal, supraoculars and parietals” would exclude the *diadema* species group from *Spalerosophis* JAN. Their terminology for circumocular scales (i.e., the perioculars) is confusing as four differently named groups including a “subpreocular” are distinguished (LEVITON et al. 1992: 86, fig. A), and is not consistent throughout the text. The description says that the eye is “encircled with 10-13 scales of various shapes” but their figure, showing a cutout of the lateral head scales of *S. diadema cliffordii* BMNH 1985.758 (GASPERETTI 1988: fig. 72), has only 9 perioculars. Elsewhere, “a ring of 8-11 small scales” surrounding the eye is reported for *S. diadema* (LEVITON et al. 1992: 215); however, MARX (1959) found as few as six (“6-10”) in populations from Iraq.

JAN (1865) gave the number of ventrals (“addominali”) for the lectotype of *S. microlepis* (see Type Material) as 263 but KRAMER & SCHNURRENBERGER (1963) noted only 255 plus two preventrals, i.e., 257 following the counting system used by some authors (e.g., LANZA 1964). Our maximum (256) for ventrals is from WALL (1908) and explained elsewhere (Morphology: third smallprint). The minimum (210) for *S. diadema* (e.g., BOULENGER 1893, WALL 1914) certainly comprises of one or two preventrals. The by far highest ventral count (278) in a female *diadema* (♂ fide MARX 1959) from “Gilgit” (BOULENGER 1893, as *Zamenis* auct.) requires re-examination and specific identification. Verification is also necessary in the case of the maximum (257) for *S. are-*

*narius* reported by MINTON (1966), the more so since BAIG & MASROOR (2008: tb. 1) gave only 228-247 (♂♂ 228-247, ♀♀ 230-247) for nine Pakistani specimens. The minimum (23) for midbody scale rows is from few specimens of *arenarius* (MINTON 1966) and *diadema cliffordii* (PASTEUR 1967). MARX (1959) recorded four *diadema* ssp. (possibly including *S. atriceps*) from Egypt and India "with the anal plate divided."

The 'Review of the colubrid snake genus *Spalerosophis*' (MARX 1959), the 'first revision' of the genus (ICZN 1966), has an odd "for official use only" forerunner (MARX 1958), a shorter version with a slightly different title published by a U.S. Navy Unit based at Cairo where the author was employed as a consultant. We are not aware of any previous quotation of this reference.

We concur with BAIG & MASROOR (2008) that *S. atriceps* (FISCHER, 1885) is a valid species as stipulated earlier by MINTON (1966), but hesitate to adopt their conclusion that *S. diadema schirasianus* (JAN, 1863) "is a junior synonym of *diadema*" (BAIG & MASROOR 2008: 113), i.e., *S. d. diadema* (see Systematics and Distribution). Their paper is afflicted with some inaccuracies and we take this opportunity to clarify the most important ones.

Certainly, BAIG & MASROOR (2008) are correct as to a difference in maximum size between *S. atriceps* (1800 mm total length) and *S. d. diadema* (see MINTON 1966). However, we do not use this dimension feature in the determination key because it does not hold true vis-à-vis *S. d. cliffordii* (MARX 1959: tb. 1).

BAIG & MASROOR (2008: tb. 1) found a clear difference between *S. arenarius* and congeneric Pakistani species (*S. atriceps*, *S. diadema*) in the number of "frontonasals" (0 versus 1-2) but this character is not explained nor discussed (or at least specifically mentioned) in their text. Intermittent

scales between the prefrontals and internasals are usually absent not only in *S. arenarius*, and all species of the *S. diadema* group normally have several (3-4) prefrontals. Although it is generally true that few supranumerical dorsal head scales are typical for *S. arenarius*, specimens of *S. diadema* ssp. without any additional scale on the pileus are reported (see Discussion).

BAIG & MASROOR (2008: 113) noted that the origin of *Coluber diadema* SCHLEGEL, 1837 is "not explicitly specified in the original work of RUSSELL" but say on the same page that it is "Bushire" (Bushehr) in Iran as stated by RUSSELL (1807) ["1801"] (see Systematics and Distribution). The first to point out that the type locality of *S. diadema* is not in India (i.e., the vicinity of Bombay) were WALL (1914: "Bushire?") and MERTENS (1940).

The map in BAIG & MASROOR (2008: fig. 7) shows two collecting sites of *S. microlepis* in southern Iran, i.e., near the Bushehr-Hormozgan-Fars border and north of the Strait of Hormuz in the hinterland of Bandar Abbas. The former may just be inaccurately placed and corresponds to the "Shiraz" record as mapped in MARX (1959) and LANZA (1964); ultimately, both entries are from GASPERETTI (1988) ["1991"] and erroneous. The literature section is weak and bibliographic references for most taxa discussed including "*Spalerosophis atriceps* FISCHER, 1885" [sic] and "*S. diadema schirasianus* [sic] JAN, 1865 [sic]" are not cited. "*Schirasianus* [sic] was treated at species level by SCHMIDT (1930)" (BAIG & MASROOR 2008: 110) should read 1939 as the year of publication.

## SPECIFIC ACCOUNT

*Spalerosophis microlepis* JAN, 1865  
Jan's Diadem Snake

*Sphalerosophis* [sic] *microlepis* JAN, 1865: 356 - "Laristan" [Lorestan, MZUT R1843] and probably vicinity of "Schiraz" (see Taxonomy, Characters and Comments, Type Material).

*Loxodon microlepis*. - SORDELLI in JAN & SORDELLI 1867: pl. 20.III ("Laristan,

Perse. - Musée de Turin" [MZUT R1843], see Taxonomy).

*Toxodon microlepis*. - SORDELLI in JAN & SORDELLI 1867: 2, and 1881: 18 (see generic synonymy and Taxonomy).

*Sphalerosophis* [sic] *microlepis*. - BLANFORD 1876: 411 (translation of original description and systematic reservation, see Taxonomy, Type Material, Discussion).

- Sphalerosophis* [sic] *microlepis* "De Filipi". - HOFFMANN 1890: 1676 ("von Laristan (Persien)").
- Zamenis microlepis*. - BOULENGER 1892: 633 (key); BOULENGER 1893: [382] tb. [383], 413 (data fide JAN 1865 and JAN & SORDELLI 1867); WERNER 1893: 92 (head scales); WERNER 1895: 18, pl. III.4a-b ("Persien", see Discussion: smallprint); WALL 1908: 799, tb. [in text] ("Maidan Mihaftan" [Maidan-e Naftun, 31°59'N / 49° 19'E, ca. 300 m a.s.l.], see Discussion: smallprint); WERNER 1929: 66, 72 (synopsis).
- S.[palerosophis] microlepis*. - SCHMIDT 1930: 226 (revalidation of *Spalerosophis* JAN).
- Spalerosophis microlepis*. - WERNER 1936: 201 (checklist); SCHMIDT 1939: 76 ("Persepolis": FMNH 20923, 20929, restriction of type locality to "Laristan").
- Spelaerosophis* [sic] [*microlepis*]. - LOVE-RIDGE 1957: [257] XXI (index, under specific name; refers to a correct entry [as *Spalerosophis*, *S. microlepis*] in the synonymy of *Coluber* auct.).
- C.[oluber] microlepis*. - CHERNOV 1959: 141 (see Discussion and SCHÄTTI et al. 2009: footnote 4).
- Spalerosophis microlepis*. - MARX 1959: [347, 348] 350, map [in text], tb. 1 ("Persepolis" [same material as in SCHMIDT 1939]: update, "Apparently restricted to the mountains of south-western Iran").
- Sphalerosophis* [sic] *microlepis*. - KRAMER & SCHNURRENBERGER 1963: [523] 525 (lectotype designation [MZUT R1843], see Characters and Comments, Type Material); LANZA 1964: 47, 58, fig. 6 [map], tb. 1 (review).
- Spalerosophis microlepis*. - TUCK 1971: 62 [67], map 22 (18 km S Masjed Soleyman: USNM 153749); SCHLEICH 1977: 128, map II (from SCHMIDT 1939).
- Spalerosophis macrolepis* [sic]. - ELTER 1981: 97 ([MZUT] "R1843 (4024)", see Type Material).
- Spalerosophis microlepis*. - WELCH 1983: 71 ("Iran").
- S.[palerosophis] microlepis*. - SCHÄTTI & MCCARTHY 1987: 266 (generic characters).
- Spalerosophis microlepis*. - LATIFI 1991: [67] 108 [154], pl. 17 [fig. 44, map] (Esfahan Province: Esfahan [32°40'N / 51°40'E, ca. 1566 m a.s.l.], Golpayegan [33°27'N / 50°17'E, ca. 1812 m], Kashan [33°59'N / 51°27'E, ca. 945 m], Khvansar [33°13'N / 50°19'E, ca. 2224 m]; Fars: Aspas ["Asopas Mountain", ca. 30°38'N / 52°24'E (village at ca. 2198 m)], Cheshmeh-ye Nabati [29°15'N / 52°55'E, ca. 1692 m], Eqlid [30°55'N / 52°42'E, ca. 2234 m], Naqsh-e Rostam [29° 59'N / 52°52'E, ca. 1610 m], "Schiraz"; Hamadan: Aqaj ["Aghach Mountain", ca. 34°57'N / 49°19'E, ca. 1861 m], Hamadan [34°48'N / 48° 31'E, ca. 1824 m], Nahavand [34° 12'N / 48° 22'E, ca. 1720 m]; Khuzestan: Masjed Soleyman ["Masjhed Solaiman"]; Lorestan: Khorramabad [33°29'N / 48°21'E, ca. 1190 m]; Markazi: Arak [34°05'N / 49°41'E, ca. 1724 m], Delijan [33°59'N / 50°41'E, ca. 1536 m], Mahallat [33° 55'N / 50°27'E, ca. 1856 m], Tafresh [34°42'N / 50°01'E, ca. 1936 m]; Qom: Qom [Ghom (City), 34°39'N / 50°53'E, ca. 925 m]; LEVITON et al. 1992: 104 (see Characters and Comments, Distribution); FRYNTA et al. 1997: 13 (Qamishlu [Esfahan: 32° 03'N / 51° 29'E, "2000-2200 m"]); LATIFI 2000: [39, 136, 309] 313, pl. 44 [incl. map] (incl. Chahar Mahall-ve Bakhtiyari [not specified]); SCHÄTTI & MONSCH 2004: 241, fig. 1 [MP tree] (Mehkuyeh: MHNG 2626.70, 12S rDNA sequence); FIROUZ 2005: 206 (Esfahan, Khuzestan, Semnan, Fars, and Hamadan provinces, see Distribution); BAIG & MASROOR 2008: 109, fig. 7 [map] (from literature, see Characters and Comments).

## Type Material

JAN (1865) described the species based on two specimens collected in Lorestan ("nel Laristan") and, apparently, near Shiraz ("proveniente a quanto pare da Schiraz"). The MZUT file entry registers the former (don. DORIA) from "Persia meridionale" (KRAMER & SCHNURRENBERGER 1963; ELTER

1981). The latter, once deposited in the MSNM collections, was destroyed during World War II (SCALI 1995: 264).

William Thomas BLANFORD did not see the larger syntype figured in JAN & SORDELLI (1867) when he visited the Turin museum (BLANFORD 1876: the "original specimen [...] could not be found") because it was some time at Milan for the preparation of the 'Iconographie' (see Taxonomy). This is the lectotype of *S. microlepis* JAN designated by KRAMER & SCHNURRENBERGER (1963: "Wir erklären N.C. 4024 aus IMZT [MZUT R1843] zum Lectotypus"). These authors were uncertain about the place of custody of the smaller paralectotype (actually, this taxonomic status is a mere formality) and definitely unaware of its fate. Their action, which would supersede any previously published statement regarding the locus typicus (ICZN 1999: arts 73.2.3, 76.2), is in accordance with SCHMIDT's (1939) restriction of the type locality to "Laristan".

ELTER (1981) listed the lectotype of *S. microlepis* without any remark on its status and actual presence. When one of us (NH) visited the MRSN (today, the collection of the former MZUT is housed with this institution) in September 2008, the specimen could not be found despite intensive search and help from the staff, and the lectotype must be considered "missing" (Franco ANDREONE in litt.).

### Morphology

Head rather distinct from neck; snout obtuse, feebly projecting. Rostral hexagonal (broadest at medium height), about as high as broad at base, hardly extending onto snout. Internasal-prefrontal area covered with 16 to 24 scales including two or more enlarged 'internasals' or 'apicals'; size and shape highly variable as exemplified by MHNG 2646.64 (Fig. 1) or the configuration in the lectotype, i.e., paired internasals only separated by a cuneiform scute and comprising two minuscule scales on anterior pileus (JAN & SORDELLI 1867: pl. 20.III.a). Supraoculars entire. Frontal usually undivided, sub-pentagonal; two distinct detached scales anteriorly in lectotype; BMNH 1920.3.20.5 with a median suture on anterior part, and left anterior edge extending to posterior can-

thus rostralis. Frontal 0.97-1.16 times as long as parietals (MHNG 2646.64, USNM 153749); the latter reduced posteriorly, not in contact with upper posterior perioculars (postoculars auct.), borders often uneven, notched along lateral edges (e.g., FMNH 20923, MNHG 2646.64, MZUT R1843).

JAN (1865) reported "20-25" small irregular scales ("piccoli scudetti irregolari") on top of the snout; the lectotype shows 24 (JAN & SORDELLI 1867: pl. 20.III.a). It is stated that the lost paralectotype agrees with the former in dorsal color pattern and pholidosis ("è in tutto eguale al primo, sia pel colorito, sia per la folidiosi"), but doubts exist whether it shared the peculiar head scale features (compact internasals, divided frontal) of the lectotype. LATIFI's (1991) remark regarding the frontal ("divided to three parts") probably quotes BOULENGER (1893: "frontal broken up into three shields") and refers to the apparently uncommon condition found in the lectotype.

Nasal divided; distance from the nostril to the eye 0.94-0.98 times the length from the posterior tip of the rostral to the frontal (MHNG 2646.64, USNM 153749). Loreal region with 4-8 (9) scales partially arranged in two longitudinal rows. 13-17 supralabials, the first (BMNH 1920.3.20.5, right side) or first and second as well as last two (WALL 1908 and left side of BMNH 1920.3.20.5) or three entire and larger (definitely higher); the remaining supralabials fragmented, giving rise to 4-6 secondary labials anteriorly. Usually 1-3 supplementary scales mostly located towards periocular ring; absent on left side of MHNG 2646.64 (Fig. 1). 10-13 perioculars completely excluding supralabials from eye, at least some scales (1-3) of upper preocular area distinctly enlarged. Temples covered with numerous small scales, about 6-8 in first and 6-9 in second temporal row.

We interpret WERNER's (1895) description of scales in the loreal region ("Drei Reihen von Frenalen übereinander mit 4, 4 und 5 Schildchen in einer Reihe, dazwischen rechts noch je eines eingeschaltet") as 8-9 loreals and 5-6 secondary (anterior) labials and supplementary scales; these scutes appear semi-schematic in the drawing (WERNER 1895: pl. III.4a) and cannot be made out individually. Our minimum for perioculars (10) is from JAN (1865). MARX (1959: tb. 1) reported 12-15 (mean 13.3) scales in the "ocular ring"; the maximum is based on FMNH 20929 with two or three intermittent small scales between the lower perioculars (suboculars auct.) and supralabials. BMNH 1920.3.20.5 has three tiny additional scales between the left lower posterior perioculars and first temporals and, depending on the method of counting, 7-9 anterior temporals.

14-17 sublabials, first and either seventh, eighth, or ninth largest; 4-6 anterior



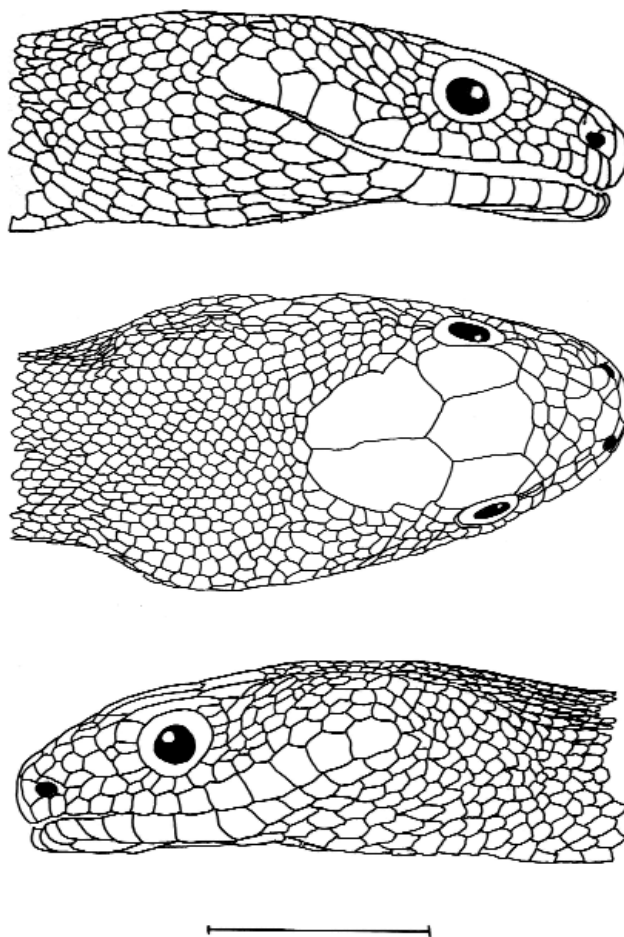


Fig. 1: Dorsal and lateral head view of *Spalerosophis microlepis* JAN, 1865 (MHNG 2646.64).  
Line equals 10 millimeters.

Abb. 1: Dorsale und laterale Kopfansicht von *Spalerosophis microlepis* JAN, 1865 (MHNG 2646.64).  
Die Linie entspricht 10 Millimetern.

sublabials in contact with first chin shield. Posterior pair of chin shields narrow (and distinctly shorter than anterior in MHNG 2646.64), medially separated by two (rostral) to four series of scales. 4-5 oblique rows of gulars between the posterior chin shields and the first ventral. 234-256 ventrals ( $\sigma \sigma$  234-239,  $\text{♀} \text{♀}$  248-256, see smallprint), obtusely angulate laterally in MHNG 2646.64. Anal scute entire. 97-109 paired subcaudals ( $\sigma \sigma$  102-104,  $\text{♀} \text{♀}$  99-109, see

smallprint); sum of ventrals and subcaudals 338-365 ( $\sigma \sigma$  338-340,  $\text{♀} \text{♀}$  351-365, see Discussion).

As few as 12 sublabials (LATIFI 1991, 2000: "12-15") could not be ascertained in our material. Literature data for ventrals (JAN 1865; WERNER 1895; WALL 1908; SCHMIDT 1939; MARX 1959) include preventrals, usually two. We accept KRAMER & SCHNURRENBERGER'S (1963) values for the lectotype, as JAN'S (1865) counts appear vague (see Characters and Comments). To judge from the number of ventrals, both type specimens (see penultimate smallprint above) seem to be females as tabulated in LANZA (1964); his maximum for ventrals

Table 1: Morphological characters of examined *Spaterosophis microlepis* JAN, 1865 and lectotype (MZUT R1843). Gender, number of ventrals (ventr.) and sub-caudals (subc.), sum thereof, number of dorsal scales at eight positions along body (ventral no. 20, 50, 75, 100, 125, 150, 200, and last ventral), number of frontals (front.) and loreals (lor.), supralabials (supral.), pericoculars (perioc.), and scales in first temporal row (temp.), snout-vent and tail length in millimeters, number of cross-bars on dorsum (cross-b.), and maxillary teeth (max. t., a plus sign denotes presence of a diastema). Slashes separate right and left side counts. An asterisk (\*) refers to explanations in the text. No further data available in the case of BMNH 1920.3.20.5 and MHNG 2626.70 (both severely damaged); exact number of dorsal cross-bars impossible to ascertain in the former. Data of MZUT R1843 from JAN & SORDELLI (1867: pl. 20.III) and KRÄMER & SCHNURRENBERGER (1963); dorsal scale counts refer to midbody data for this specimen and the lost paralectotype as given in JAN (1865).

Tab. 1: Morphologische Merkmale der untersuchten *Spaterosophis microlepis* JAN, 1865 und des Lectotypus (MZUT R1843). Geschlecht, Anzahl Ventralia (ventr.) und Subcaudalia (subc.) sowie deren Summe (sum), Anzahl dorsaler Schuppenreihen an acht Stellen entlang des Rumpfs (Ventralia Nr. 20, 50, 75, 100, 125, 150, 200, und letztes Ventrale), Anzahl Frontalia (front.), Lorealia (lor.), Supralabialia (supral.), Pericocularia (perioc.) und Schuppen der ersten Temporalreihe (temp.), Kopf-Rumpf- und Schwanzlänge (Länge) in Millimetern, Anzahl der Querbalke auf dem Rücken (Querb.) und der Maxillarzähne (Max.-Z., ein Pluszeichen steht für das Vorhandensein eines Diastemas). Querstriche trennen Werte für rechte und linke Seite. Ein Sternchen (\*) verweist auf Erklärungen im Text. Im Falle von BMNH 1920.3.20.5 und MHNG 2626.70 fehlen weitere Daten (beide stark beschädigt); genaue Anzahl dorsaler Querbalke bei ersterem nicht zu ermitteln. Angaben für MZUT R1843 aus JAN & SORDELLI (1867: Taf. 20.III) und KRÄMER & SCHNURRENBERGER (1963); der Dorsalwert gilt für die Körpermitte bei diesem Exemplar und dem verschollenen Paralectotypus wie bei JAN (1865) erwähnt.

Specimen (gender) Exemplar (Geschlecht)	ventr.	subc.	sum	dorsal scale rows / dorsale Schuppenreihen								front.	lor.	supral.	perioc.	temp.	length Länge	cross-b. Querb.	max. t. Max.-Z.
				20	50	75	100	125	150	200	I.								
FMNH 20923 (♂)	239	-	-	36	39	41	43	41	?	27	24	1	8	15/14	13	7	645+?	65	15+2
FMNH 20929 (♂)	238	102	340	37	38	41	42	42	33	27	24	1	-	15/16	12	6/8	790+217	72	16
USNM 153749 (♂)	234	104	338	36	36	?	41	41	33	27	23	1	8	14/15	12	6	405+106	ca. 70	-
BMNH 1920.3.20.5 (♀)	-	-	-	-	-	-	-	-	-	-	-	*	7/8	1.4	13	7 (9*)	[subadult]	>70*	-
MHNG 2626.70 (♀)	248	-	-	35	37	41	43	41	35	27	25	-	-	-	-	-	ca. 402+?	66	-
MHNG 2646.64 (♀)	252	99	351	37	37	41	43	43	38	29	23	1	4	14/13	12/13	7/6	398+95	68	13+2
MZUT R1843 (♀)	255	99	354	-	-	-	( <sup>1</sup> 41-43 <sup>1</sup> )	-	-	-	-	3	8/6	1.5	13/11	6	1000+250	63	15+2

Table 2: Transverse level and longitudinal position of additions and reductions of dorsal scale rows of *Spalerosophis microlepis* JAN, 1865 (MHNG 2626.70 and MHNG 2646.64). Indicated are the involved longitudinal rows and the ventral (in parenthesis) where the change occurs on the right (upper row) and left (lower) side, and the number of longitudinal dorsal rows (middle line).

Tab. 2: Querniveaus und Längspositionen der Zu- und Abnahmen der Dorsalreihen bei *Spalerosophis microlepis* JAN, 1865 (MHNG 2626.70 und MHNG 2646.64). Angegeben sind die beteiligten Schuppenlängsreihen und das Ventrale (in Klammer) wo der Wechsel auf der rechten (obere Reihe) und linken (untere) Seite stattfindet sowie die Anzahl der Dorsalialängsreihen (mittlere Zeile).

MHNG 2626.70														
33	11+12 (18)	35	5+6 (43)	37	18+19 (54)	39	4+5 (67)	41	19+20 (90)	43	13+14 (112)	41	3+4 [130]	39
	11+12 (20)		5+6 (46)		18+19 (52)		3+4 (76)		18+19 (96)		13+14 (120)		3+4 [130]	
39	10+11 (142)	37	16+17 (147)	35	3+4, 16+17 (158)	31	15+16 (180)	29	14+15 (193)	27	13+14 (208)		25 (248)	
	[irregular, damaged]		16+17 (145)		3+4, 16+17 (153)		15+16 (182)		14+15 (188)		13+14 (212)			
MHNG 2646.64														
35	3+4 (18)	37	4+5 (45)	35	17+18 (47)	37	17+18 (54)	39	3+4 (64)	41	18+19 (94)	43	19+20 (130)	41
	3+4 (18)		3+4 (44)		18+19 (49)		17+18 (58)		3+4 (72)		18+19 (99)		19+20 (127)	
41	3+4 (135)	39		38		37	12+13 (154)	36	3+4 (156)	35	16+17 (162)	33	16+17 (177)	31
	3+4 (137)		11+12 (146)		3+4 (152)						16+17 (166)		16+17 (174)	
31	15+16 (186)	29	14+15 (208)	27	13+14 (233)	25	12+13 (240)	23 (252)						
	15+16 (189)		14+15 (215)		13+14 (229)		12+13 (249)							

(257) is from KRAMER & SCHNURRENBERGER's (1963) count (2+255) for the lectotype. Our highest value (256) is WALL's (1908) "258" in a specimen from near Masjed Soleyman, probably a female. A second individual from the same collecting site with "244?" ventrals remains unsexed, as is also the case with WERNER's (1895) "248" (see Discussion). The lowest number of subcaudals (97) considered to be based on a complete tail is from WALL's (1908) specimen of unknown gender, and the maximum for the sum of ventrals and subcaudals (365) from his supposed female. LATIFI's (1991, 2000) data ("224-252 ventrals; 90-109 subcaudals") do not seem reliable.

Dorsal scales smooth, with paired apical pits. First row distinctly enlarged; scales in second of variable size, resulting in two or three scales in contact with lowest (first) row. Paraventral and lateral dorsals usually small and homogeneous, but somewhat enlarged scales occur along rows 3-11 in, for instance, MHNG 2626.70. Dorsals tend to become smaller towards vertebral row; MHNG 2626.70 shows intermittent large scales on a short portion of the vertebral row before midbody (see smallprint). Dorsals in 35-37 longitudinal series across trunk at the 20<sup>th</sup> ventral, 36-39 (ventral 50), 41 (75), 41-43 (100), 41-43 (125), 33-38 (150), 27-29 (200), and 23-25 above last ventral; 41-43 exactly at midbody (50%ven); maximum

along trunk 41 in USNM 153749 and 42 in FMNH 20929 (Table 1).

The illustrations of the lectotype (JAN & SORDELLI 1867: pl. 20.III.a) clearly show different size of scales in the second dorsal row and variation in the number of scales in contact with those of the enlarged first row. WALL (1908) described the dorsal scales as follows: "The ultimate costal row is relatively very large, being nearly three times as broad as the median rows and the length of each scale is about twice that of the scales in the penultimate row. It is also very peculiar in that each scale touches three above instead of two which is the almost invariable rule in snakes." However, this configuration, i.e., the contact of scales in the second (WALL's "penultimate") vis-à-vis "each scale" of the first ("ultimate") row has not been observed by us and can only be explained by more or less homogeneous dorsals, i.e., the lack of enlarged scales in the second row.

The increase of dorsal scale rows on the forebody is made up of additions at paraventral, lateral, and 'high' (paravertebral positions or vertebral row) levels. The first reduction (from 43 to 41 dorsal rows) in FMNH 20923 occurs immediately in front of midbody, and at 47%ven (average of right and left counts) in MHNG 2626.70. Nineteen bilateral reductions of two females with detailed and complete data (Table 2) are paraventral (8 cases), lateral (6, rows 10-14), paravertebral (8), or involve the verte-



Fig. 2: Subadult *Spalerosophis microlepis* JAN, 1865 (MHNG 2646.64, ♀) from Lama, Boyer Ahmadi-ye Sardsir-ve Kohkiluyeh, Iran.

Abb. 2: Subadultler *Spalerosophis microlepis* JAN, 1865 (MHNG 2646.64, ♀) von Lama, Boyer Ahmadi-ye Sardsir-ve Kohkiluyeh, Iran.

bral row (16); the latter occupy, for instance, the last three (from 31 to 25 dorsal rows) or five (33 to 23) reductions, respectively. In FMNH 20929, the vertebral row participates in the reductions from 33 to 27. In MHNG 2626.70, a 'low' (rows 3+4) and 'high' (16+17) reduction (35 to 31) are found at identical positions along the body axis (Table 2). The two bilateral steps from 39 to 35 dorsals ('high', 'low') in MHNG 2646.64 first complete on the left (ventrals 146-152), immediately followed by their right counterparts (154-156).

The complete and detailed ascertainment of the dorsal scale pattern of *S. microlepis* is an arduous task. MHNG 2626.70, for example, has irregular additions and reductions all along the portion from 41 to 37 dorsal scale rows (i.e., fluctuation between 41 and 39 from ventrals 130 to 141) involving paraventral levels (rows 3+4); moreover, the situation is complicated by intermittent smaller and larger scales; additionally, irregular large scutes occur on or along the vertebral row between ventrals 110 and 115. In MHNG 2646.64, short-range additions and reductions are found between ventrals 150 and 170. FMNH 20929 is outstanding for its even number of dorsals (42) along a good part in

front and after midbody (ventrals 100-136); it reduces to 40 at ventral 137 (right) and 140 (left) involving 'high' levels (rows 19-21).

The longest dimension reported (LATIFI 1991) is a total maximum length of approximately 1430 mm (tail 290). Fide KRAMER & SCHNURRENBERGER (1963), the supposedly female lectotype measures 1250 mm (tail 250). The largest male (FMNH 29323) measures approximately 790 + 217 mm. The tail/body length ratio is 0.24-0.27 ( $\sigma\sigma$  0.26-0.27,  $\text{♀}$  ♀ 0.24-0.25).

JAN's (1865) measurements for the lectotype result in a tail/body ratio 0.24, as in WERNER's (1895) subadult. According to SCHMIDT (1939), FMNH 29323 has "1005 [mm] in total length" and the tail "270" which would yield the impossible ratio of 0.37 (see Table 1). Four out of six specimens examined are subadults.

Greyish, pale buff, or slightly reddish brown above. Head at least in smaller specimens with a bold transverse band in the internasal area and between the anterior border of the eyes, a dark brown or blackish streak from the nasal and across the eye to



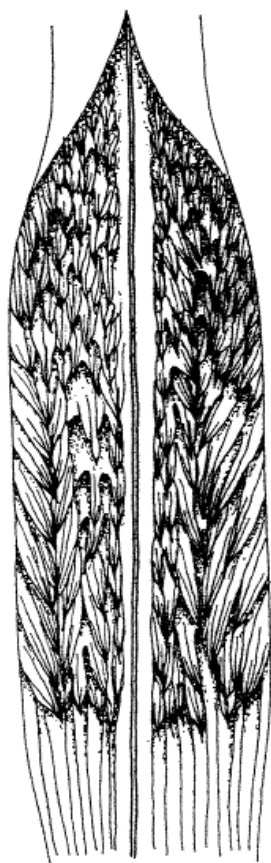


Fig. 3: Left hemipenis of *Spalerosophis microlepis* JAN, 1865 (FMNH 20929, in situ).

Line equals 5 millimeters. Drawing by Heidi LAUBSCHER and Andrea STUTZ.

Abb. 3: Linker Hemipenis von *Spalerosophis microlepis* JAN, 1865 (FMNH 20929, in situ).

Die Linie entspricht 5 Millimetern.

Zeichnung: Heidi LAUBSCHER und Andrea STUTZ.

the angle of the mouth, supralabials speckled, and two posteriorly diverging stripes on the parietals and/or the nape. 63-72 or possibly slightly more (BMNH 1920.3.20.5, see Table 1) narrow, well-defined, regular, dark cross-bars along trunk; at best half as wide as interspaces on anterior portion, distance between bands larger posteriorly. Neck with a longitudinal stripe along the flank from dorsal rows 6-9 (two or three

rows wide, reaching ventral 45 in MHNG 2646.64) giving way to transverse blotches that are shorter than the juxtaposed paravertebral cross-bars. Below, at least in juveniles and subadults (BMNH 1920.3.20.5, MHNG 2626.70, 2646.64), a series of smaller less distinct spots or short and mostly vertical, or oblique, streaks alternating with lateral blotches. Dorsal color pattern continues on tail (approximately 20-30 paravertebral cross-bars) and tapers off as small dots towards tip. Lower parts yellowish, lateral edges speckled with brown or blackish.

The unlocated subadult from "Persien" figured in WERNER (1895: pl. III.4a) shows, at least on the right side, a continuous lateral line almost reaching midbody and a paraventral stripe of similar extent. Though, the text mentions only one "Längslinie" on the anterior portion of the trunk ("endet hinter dem ersten Rumpfviertel") and describes the paraventral markings as interrupted longitudinal stripes ("kurze Längsstriche"). The neck pattern strongly resembles *Rhinechis scalaris* (SCHINZ, 1822) [fide MERTENS & WERMUTH (1961); specific name, authorship, and dating contested] as accurately remarked by WERNER (1895). WALL (1908) found "Costally 3 or 4 series of quincunciate arranged spots decreasing in size from above downwards [...], the uppermost alternating with the vertebral series."

Maxillary with 15-17 arcuate teeth; anterior series (except first) isodont, posterior two teeth usually separated by a diastema (not so in FMNH 20929); the latter are slightly enlarged (FMNH 20923, 20929, MHNG 2646.64) and offset laterad (2) or not (FMNH 20929); in MHNG 2646.64, the points of the postdiastemal teeth are directed inwards. Nine teeth in palatine, 15 in pterygoid (MZUT R1843), and 22-23 subisodont teeth in dentary. Hemipenis spinose and probably subcylindrical when everted; spines stronger and larger at base, *sulcus spermaticus* simple (Fig. 3). Apex in situ at subcaudals 15-16 (14-15%subc); insertion of retractor muscle at subcaudals 46-51 (44-50%subc). USNM 153749 shows traces of the umbilical scar on ventrals 210-212.

The curved (loxoodont) maxillary teeth are the eponymous feature for SORDELLI's generic substitute name (see Taxonomy). Dentition data for the lectotype are from KRAMER & SCHNURRENBERGER (1963) who noted "15+2" maxillary teeth; the senior author is quoted in LANZA (1964) regarding their size and the condition of the interspace ("cumatodonte e diacranterica [...] secondo KRAMER, in litt."). According to JAN (1865), however, the teeth are equal in size and the lectotype lacks a diastema ("Denti [...] uguali in grandezza, senza intervallo (Isodonto)"); by all means, KRAMER & SCHNURRENBERGER (1963) used the term "kumatodont" (i.e., anterior and posterior teeth shorter

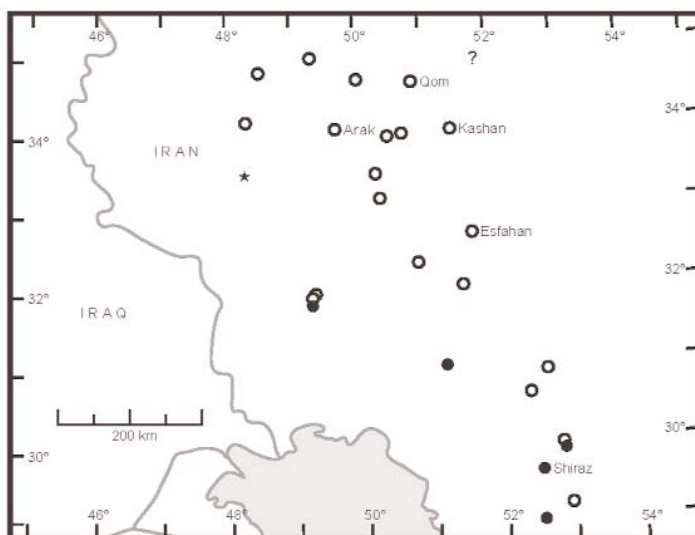


Fig. 4: Distribution of *Spalerosophis microlepis* JAN, 1865 based on the examined material (●) and literature records (○). The type locality (★) in “Laristan” is arbitrarily mapped at Khorramabad (33°29'N / 48°21'E, capital), and the record from Chahar Mahall-ve Bakhtiyari Province (LATIFI 2000) at 32°20'N / 50°52'E (Shahr-e Kord, capital). The question mark refers to the unspecified “Semnan” record (FIROUZ 2005).

Abb. 4: Verbreitung von *Spalerosophis microlepis* JAN, 1865 auf Grund des untersuchten Materials (●) und Angaben aus der Literatur (○). Die Typuslokalität (★) in “Laristan” ist willkürlich bei Khorramabad (33°29'N / 48°21'E, Hauptstadt) eingefügt, und der Fund aus der Provinz Chahar Mahall-ve Bakhtiyari (LATIFI 2000) bei 32°20'N / 50°52'E (Shahr-e Kord, Hauptstadt). Das Fragezeichen betrifft den nicht näher erklärten Fund aus “Semnan” (FIROUZ 2005).

than remaining) in context with the dentary. The term “offset laterad” for the last two maxillary teeth as used by the senior author of this paper for Racers and their allies is admittedly equivocal. However, osteological restraints exclude ambiguity and suggest to use “laterad” in its common meaning as “on the side” with respect to the row of sockets running along the maxillary; actually, the position of the postdiastemal teeth vis-à-vis the axis of the maxillary is, strictly speaking, median, and not lateral.

#### Distribution

*Spalerosophis microlepis* is restricted to the central and southern Zagros Range (West Iran) and adjacent areas from Hamadan to Northeast Khuzestan (vicinity of Masjed Soleyman) and South Fars (Mehkuyeh) including Boyer Ahmadi-ye Sardsir-ve Kohkiluyeh, Chahar Mahall-ve Bakhtiyari, Esfahan, Lorestan, Markazi, and a record from Qom City at the fringes of the Dasht-e Kavir. It may occur in West Kerman, North Hormozgan, and extreme western Yazd Province. FIROUZ (2005) listed the species

from Semnan (province no. “13”), which is clearly beyond the fringes of the Zagros Range and requires confirmation.

RAI’s (1965) thesis on the colubrids of Iran did not deal with *S. microlepis*, after all an endemic species. Some southern collecting sites mapped in LANZA (1964: fig. 6), GASPERETTI (1988: fig. 71), and BAIG & MASROOR (2008: fig. 7) are inaccurate or erroneous (see Characters and Comments). LEVITON et al. (1992) speculated about the possible occurrence of *S. microlepis* in Iraq (“it should be looked for [...] in the foothills of the Zagros Mountains”).

LATIFI’s (1991) reports from Esfahan, Hamadan, Markazi, and Qom (“Central”) provinces as well as recent records (FRYNTA et al. 1997; SCHÄTTI & MONSCH 2004) considerably extend the known distribution of this formerly poorly known colubrine snake. Some collecting sites in Fars and Esfahan (e.g., Eqlid, Khvansar) are situated at over 2200 m above sea level, and the Qamishlu

specimen was probably obtained slightly above 2000 m. The lowest elevations recorded are at ca. 300 m in the Khuzestan foothills east of the Ahvaz Plain (WALL 1908; TUCK 1971: USNM 153749).

The distribution pattern of *S. microlepis* differs from two lizard species endemic to the Zagros Range, i.e., *Tropicolotes* [or *Microgecko*] *helenae* (NIKOLSKII, 1907) and *Lacerta* [*Timon*] *princeps* BLANFORD, 1874, in its north-eastern expansion (see maps in ANDERSON 1999). The latter's habitat "may prove to coincide more or less completely with the remaining almond-pistachio and deciduous oak climax forests of the

Zagros Mountains." *Tropicolotes helenae* encroaches the western foothills. At any rate, "the extent of their distribution is undetermined" (ANDERSON 1999).

MHNG 2646.64 from Lama (Fig. 2) was found active on a partly shaded stony slope in the late morning hours. The Mehkuyeh record was killed by locals around noon in a rocky outcrop among cultivated fields. LATIFI (2000) mentioned *S. microlepis* from various habitats including deserts and pasture, and reported 3-5 eggs in this species.

## DISCUSSION

The systematic concept of *Spalerosophis* JAN was subject to modifications over the past 140 years or so. Originally described as a monotypic genus for *S. microlepis*, BLANFORD (1876) doubted the generic distinctiveness of that species ("It appears to me that this form is simply a *Zamenis* (or *Periops*) in which the division of the head scales has been carried farther than in *Z. diadema* and its allies"). Later authorities (e.g., BOULENGER 1893; WERNER 1929) lumped Diadem Snakes, and in particular the type species, with *Zamenis* auct. (i.e., Racers and allies) until SCHMIDT (1930) resurrected *Spalerosophis* and recognized, as did the first reviser of the genus (MARX 1959), three valid species including *S. arenarius* from Northwest India and Pakistan and the wide-ranging polytypic *S. diadema* (see Systematics and Distribution).

LANZA (1964) described *S. josephscortecii* from Somalia (Puntland). MINTON (1966) and PASTEUR (1967) conferred species status to two taxa originally described as varieties ("var.") of *S. diadema* (under *Zamenis* auct.), i.e., *S. atriceps* (FISCHER) from North India and Pakistan ("the strikingly different color variety *atriceps*" of *S. d. diadema* sensu MARX) and *S. dolichospilus* (WERNER) from Northwest Africa (Maghreb), respectively (see BAIG & MASROOR 2008).

The remarkable *S. josephscortecii* shows an even more advanced fragmentation of the posterior pileus (supraoculars, frontal, parietals) and slightly more temporals in the first and second rows than observed in *S. microlepis*, has the anal scute

divided, and is dimorphic, i.e., spotted or uniform (LANZA 1978). Its dorsal color pattern, if present, closely reminds of the one found in *S. dolichospilus* (see, e.g., MARX 1959: fig. 59B; BONS & GENIEZ 1996: photograph [p. 221]; GENIEZ et al. 2004: photographs 174-177).

Character states considered to be diagnostic for *Spalerosophis* JAN are (1) a complete ring of "oculars", actually the lower peroculars, "excluding the upper labials from the orbit", (2) "prefrontals and loreals broken up into small scales", (3) a "high number of temporal scales", and (4) an entire anal plate (MARX 1959). This last feature (see Characters and Comments) no longer holds because of the divided condition in *S. josephscortecii*. Regarding prefrontals, and the pileus in general, CHERNOV (1959: 141-142, 150) mentioned rare incidences ("redkikh sluchajakh") of *S. diadema* (as *Coluber tyria* LINNAEUS, 1758; see SCHÄTTI et al. 2009) with no supranumerical scale between the rostral and frontal at all. This is, for instance, the case with the lectotype of *S. d. cliffordii* (SCHLEGEL, 1837: pl. VI.13). Size and number of anterior temporals are highly variable in comparatively small areas (e.g., "Egypt" or "Iraq") occupied by *S. diadema* (MARX 1959: tb. 1). Three scales in the first temporal row are shown in BOULENGER's (1893: pl. XXVI-II.2) illustration of *S. arenarius*; BAIG & MASROOR (2008: tb. 1) reported four in seven out of nine Pakistani specimens examined.

MARX (1959) regarded the type species, *S. microlepis*, a "distinct form" for its

advanced fragmentation of lateral and dorsal head scales, the high number of midbody scale rows, and, probably, its peculiar dorsal color pattern composed of well-defined cross-bars. Actually, *S. microlepis* differs from congeneric species except *S. joseph-scorteccii* (see above) in, for instance, more temporals in the first and second rows, at least partially fragmented internasals (usually broken up into various smaller scales), prefrontal area completely covered by irregular scales, and much higher (41-45 versus 33 or less) midbody scale row counts (see Key).

MARX (1959) had known about *S. microlepis* "only from seven specimens", four of them including the paralectotype lost or unlocated (see Type Material). Actually, he studied just those two individuals from "Persepolis" (Takht-e Jamshid, FMNH 20923 and 20929) examined before by SCHMIDT (1939) - although this is not stated anywhere in the text -, and his morphological data entirely rely on these specimens and JAN'S (1865) not very accurate information on the lectotype (see Characters and Comments). A subadult specimen from an unspecified place in "Persien" (coll. Josef BORNMÜLLER) described and figured in WERNER (1895) and the Qamishlu record of FRYNTA et al. (1997) could not be located. At least one of two *S. microlepis* collected by Lieut. A. T. WILSON near Masjed Soleyman ("Maidan Mihaftan") in Khuzestan (WALL 1908) seems to be housed with the BNHM collection (Ashok CAPTAIN in litt.).

Even when including WERNER'S (1895) unsexed specimen (female?) from "Persien" with approximately 246 ventrals (preventrals excluded), data suggest sexual dimorphism in this character for *S. microlepis*. BAIG & MASROOR'S (2008: tb. 1) ventral counts of Pakistani *S. arenarius* show virtually identical values for both genders (see Characters and Comments). According to the data in MARX (1959: tb. 1), *S. diadema* appears to exhibit sexual dimorphism in, for example, "Egypt"; however, the number of ventrals of four Iraqi males ("223-226") is completely within the range of four females ("215-228"). Although the sum of ventrals and subcaudals (346) of WERNER'S (1895) missing subadult considerably narrows the gap between male and female counts (340 or less in unquestionable ♂♂ versus 351 or more in ♀♀), this character remains sexually dimorphic in *S. microlepis*.

The type species shows surprising variability in head and body scales (Tables 1-2) within a genus already capricious and notorious regarding these features. With re-

gard to head scales, for instance, MHNG 2646.64 has fewer (4 versus 6 or more) loreals and secondary (anterior) labials (4 vs. 5-6) than normally found in the species, and lacks supplementary scales (usually 1-3) on one side (Fig. 1). Furthermore, there is amazing divergence in the condition of the postdiastemal teeth (see below).

Compared to Palaearctic Racers and their allies including Ratsnakes (UTIGER et al. 2002, 2005), at least *S. microlepis* is outstanding for the occurrence of additions and reductions of dorsal scale rows at nearly all levels along the body axis, i.e., paraventral, lateral, paravertebral, and vertebral. This species is also noteworthy for reductions that sometimes initiate before midbody, i.e., the highest dorsal count may occur on the posteriormost portion of the forebody.

*Spalerosophis microlepis* seems to be the only species of Diadem Snakes with persistently smooth dorsal scales. They are described as smooth ("lisce") in *S. joseph-scorteccii* (LANZA 1964) but re-examination of the paratype ("allotypus") revealed that paravertebral dorsals of the posterior body bear keels; they are smooth in two subadults (see Materials and Terminology). MINTON (1966) found differences among Pakistani species, i.e., "keeled" dorsals in *S. arenarius* and *S. atriceps* versus "very weakly keeled" scales in *S. d. diadema* and "smooth or with traces of keels" in *S. d. schirazianus* [sic] (see Systematics and Distribution).

SCHMIDT (1930, 1939), MARX (1959), LANZA (1964), or BAIG & MASROOR (2008) did not pay a great deal of attention to this character. BOULENGER (1893) described the dorsal scales of *Zamenis diadema* auct. (including, e.g., *S. atriceps* and *S. d. cliffordii*) as "usually more or less obtusely keeled". It remains a mystery how SCHLEGEL (1837) established, in blatant contradiction to RUSSELL'S (1807) illustration and text ("smooth"), the keeled condition of dorsal scales in the lectotype of *S. diadema* (see Systematics and Distribution).

As in the case of the degree of keeling of dorsal scales, and probably hemipenis features (see below), the configuration of the maxillary teeth (and possibly their number) needs special consideration in future systematic studies on *Spalerosophis* spp., in particular with regard to its potential diagnostic value. WALL (1914) noted an "uninterrupted" series of maxillary teeth in four *Zamenis diadema* auct. (possibly *S. atriceps*) from India and Pakistan. CHERNOV



(1959: 141, as *Coluber* auct.) studied cranial characters in *S. diadema* (as *C. tyria* LINNAEUS, 1758) and Racers of the genera *Hemorrhoids* (BOIE, 1826) and *Platyceps* (BLYTH, 1860); apparently, he did not discover differences worth mentioning (Racers have an interspace separating the anterior teeth from a pair of usually enlarged posterior teeth). LANZA (1964: footnote pp. 47-48) reported variation (diastema present or absent) in *S. d. cliffordii* but LEVITON et al. (1992), in their generic diagnosis, noted “maxillary teeth of equal size, without intervals” (see Characters and Comments). Twenty-five randomly selected *S. diadema* auct. from the Central Sahara to the Himalayas show high variation regarding the condition of the diastema (distinct to virtually absent), but further conclusions are difficult to be drawn from this sample and scarce information in literature. A maxillary diastema appears to lack in *S. josephscortecii* as evidenced by LANZA’s (1964: fig. 4E) illustration (holotype) and the configuration in two subadults (see Materials and Terminology). *Spalerosophis microlepis* shows variation in the size of the diastema and details of the postdiastemal teeth.

The following determination key includes literature data specified in the material section. The maximum for perioculars (14) in the *Spalerosophis diadema* group (*S.*

*diadema cliffordii* from “Egypt”, MARX 1959: tb. 1) requires confirmation. Due to lack of information regarding the conditions in some taxa and reasons explained elsewhere (see Characters and Comments), the differential diagnosis does not take into consideration a number of characters which may be useful in restricted areas to separate and identify, for instance, *S. arenarius* (e.g., absence of “frontonasals”) or *S. dolichospilus* (hemipenis ornamentation).

*Spalerosophis diadema* is in need of a more profound analysis. Subspecific distinction entirely relies on the number of subcaudals (SCHMIDT 1939; MARX 1959). For the sake of convenience, we follow the latest revision of eastern Diadem Snakes (BAIG & MASROOR 2008) and refrain from considering *S. d. schirasianus* (JAN), but remind the inclined reader of the considerations in context with the type material of *Coluber diadema* SCHLEGEL (origin, number of subcaudals) set forth in the generic section (Systematics and Distribution). If the type locality “Buchier” turns out to be correct, populations from Southwest Iran (Bushehr) and possibly more western lowland areas (*S. diadema cliffordii* [sic] sensu MARX) would belong to the nominate subspecies, and those from the Iranian Plateau to Central Asia and Northwest India would need to be named *S. d. schirasianus* (JAN, 1863).

#### KEY TO THE SPECIES OF THE GENUS *SPALEROSOPHIS* JAN, 1865

- 1 Dorsal scales at midbody in 36-45 longitudinal rows, 13-17 supralabials, 10-15 perioculars, 6-10 temporals in first row:.....6
- Dorsal scales at midbody in 25-33 (rarely 23) longitudinal rows, 10-14 supralabials, 6-14 perioculars (see remark above), 3-6 temporals in first row [*diadema* group]:.....2
- 2 Rostral deeply wedged between the internasals, dorsals keeled (Northwest India, Pakistan):.....*S. arenarius*
- Rostral not distinctly separating internasals anteriorly, dorsals smooth or keeled:.....3
- 3 Dorsal color pattern of adults extremely variable (often straw yellow to orange, body usually with irregular black flecks and/or blotches as if snake had been spattered with tar, or with sooty blotches often fused along midline; sometimes completely melanistic), head black or with black mottling, dorsal scales keeled (North India, South Nepal?, Pakistan):.....*S. atriceps*
- Head markings and dorsal blotches dark brown to pale grey, buff, or khaki, and more or less regular, dorsal scales smooth or keeled (smooth or weakly keeled in area of sympatry with *atriceps* [Pakistan, possibly Northwest India]):.....4

- 4 Dorsal spots with a distinct dark border, largest comprising at least 40 scales, 31-33 longitudinal rows of dorsals at midbody (Maghreb):.....*S. dolichospilus*  
 - Dorsal coloration not as described above, 25 (rarely 23) to 33 longitudinal rows of dorsals at midbody (29 or less in Northwest Africa):.....5  
 5 Subcaudals 80 or more (Iran to Central Asia and western Himalayas):.....  
 .....*S. d. diadema* [auct.]  
 - Subcaudals less than 80 (western Sahara to Southwest Iran [Khuzestan]):  
 .....*S. d. cliffordii* [auct.]  
 6 36-39 midbody scale rows, internasals paired, frontal broken up, parietals largely fragmented, 7-10 temporals in first row, scales in second longitudinal dorsal row subequal, anal scute divided, with a median series of roundish spots or without dorsal markings (only known from Galgalo oasis, Horn of Africa):.....*S. josephscortecii*  
 - 41-45 midbody scale rows, at least 3 (lectotype) internasals (normally broken up into 4 or more scales), frontal usually entire, parietals mostly entire but reduced in size, 6-8 temporals in first row, scales in second longitudinal dorsal row of variable size, anal scute entire, with a median series of well-defined regular cross-bars distinctly separated by lighter interspaces (West Iran):....*S. microlepis*

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