

A BIBLIOGRAPHIC RECOMPILATION OF THE GENUS *Mesalina* GRAY, 1838 (SAURIA: LACERTIDAE) WITH A KEY TO THE SPECIES

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In this study we review the species of lizards in the genus *Mesalina* (Lacertidae) and present a new key for their identification. We also obtained five photos of each species from the British Museum of Natural History that illustrate the dorsal, lateral (right and left), and ventral views of the head and the femoral pores of each species. The papers with the original descriptions of each species were reviewed and used in preparation of the key. Some remarks about the habitat, natural history, updated distribution map and previous taxonomic changes are explained.

Keywords: genus *Mesalina*; new identification key; Middle East; North Africa.

INTRODUCTION

According to the recent data, the Lacertidae moved into Africa in the Miocene over a land bridge that connected Arabia and Africa until the early Pliocene (Mayer and Benyr, 1995; Arnold et al., 2007). Although dates for the initial radiation of African lacertids conflict with this hypothesis, the land bridge could still have played an important role in the dispersal of certain members of the Saharo-Eurasian clade. Subfamily Eremiadinae is one of the important groups in Saharo-Eurasian clade that dispersed from Eurasia to Africa (Fu, 1998). Within that group, only *Adolfus* and *Holaspis* are truly African in distribution, while the remaining genera are Palearctic (Kapli et al., 2008). Distributions of *Acanthodactylus*, *Mesalina*, and *Ophisops* in Africa are mainly restricted to the northern Mediterranean coast, and the majority of species of the genera *Acanthodactylus* and *Mesalina* occur in northern Africa, but the most species of the genera *Ophisops* and *Eremias*, are found in the Middle East and Asia. This pattern suggests that the Saharo-Eurasian lineage may have originated in Eurasia and only partially

left the Palearctic, as opposed to secondarily recolonizing the Middle East and Asia from Africa. In fact, the land bridge could have been crossed in the other direction, with the ancestors of modern *Acanthodactylus*, *Mesalina*, and *Ophisops* entering Africa from Arabia once the continents established secondary contact (Mayer and Pavlicev, 2007; Hipsley et al., 2009).

Mesalina is a widespread lacertid genus occurring throughout the Saharo-Sindian region from North Africa to Pakistan (Anderson, 1999). It has been revised several times (Kapli et al., 2008), but the phylogenetic relationships among the species remain unclear. All species of the genus are relatively small. Arnold (1986) proposed dividing the genus into two groups based on hemipenial characters and suggested that one subspecies of *M. gutturalata* (*M. g. watsonana*) and three of *M. olivieri* (*M. o. simoni*, *M. o. balfouri*, *M. o. martini*) deserved full specific status. According to Fu (1998), lacertid lizards probably arose in the European area in the mid-Miocene, with the Gallotiinae reaching northwest Africa and the Canary Islands later, and the ancestor of the Eremiadinae occupying Africa (Arnold et al., 2007). The Saharo-Eurasian and Ethiopian clades of the Eremiadinae separated from Lacertini about 40 – 43 Mya (Hipsley et al., 2009). It is likely that the increased rates of speciation in desert lineages such as *Mesalina* may have been due to selection pressures experienced in extreme environment and adaptations to xeric habitat (Hipsley et al., 2009). We believe that dispersal from the Sinai desert and the resulting filter

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barrier played a key role in speciation in Sahara-Eurasian clades.

MATERIAL AND METHODS

In this study we reviewed all of the original descriptions and other important papers concerning the species of *Mesalina* including: Blanford (1881), Boulenger (1897), Boulenger (1917), Bons (1960), Arnold (1973), Lanza and Poggesi (1975), Arnold (1977), Mayer and Benyr (1995), Joger and Mayer (2002) and Segoli et al. (2002). Based on these references we compiled a brief description and diagnosis for each species of the genus.

We also requested 55 photos from British Museum of Natural History (BMNH) belonging to 11 species of *Mesalina*. Differences among several species were based on head scales and their arrangements. For example, the dorsal and lateral views of the head of each species are shown in Figs. 1 and 2. We also obtained five photos of *Mesalina ercolinii* from Jiri Smíd and Tomas Mazuch (see *Acknowledgments*).

Following brief remarks on *Mesalina*, we present a new identification key for all 14 species of the genus.

SPECIES ACCOUNTS

Genus *Mesalina* Gray, 1838

Mesalina Gray, 1838a: 282 (type species: *Mesalina lichtensteinii* Gray, 1838 [= *Lacerta rubropunctata* Lichtenstein, 1823]).

Diagnosis. Head shields normal; occipital shield usually present; lower nasal in contact with first supralabial only; nostril between 3 nasals and widely separated from supralabials; sometimes 2 or more transparent shields in lower eyelid; abdominal plates in parallel longitudinal rows.

Distribution. North Africa and southwest Asia, from Morocco to Pakistan, Somalia to Turkmenistan.

Mesalina adramitana (Boulenger, 1917)

Types. BMNH 1946.8.6.61 – 68

Type locality: “Hadramut, South Arabia”

Eremias adramitana: Boulenger, 1917:279 (Type locality: Hadarmawt).

Mesalina adramitana: Arnold, 1986:426. Ross, 1988:453.

Diagnosis. Occipital scale absent or very small; scales on upper surface of lower leg smooth or only obliquely keeled; ventral scales not all the same width, those bordering midline narrower than those lateral to

them; usually 10 ventral scales in longest rows across mid belly; adults usually not more than 42 mm snout-vent; tail not bright blue; 29 – 37 dorsal scales across midbody; gulars from symphysis of chin shields to collar 21 – 31; femoral pores 10 – 14; scales under 4th toe 21 – 26; no clear row of enlarged scales beneath lower forelimb; scales on upper surface of lower hind limb obviously larger than dorsals between hind limbs; pattern variable, often with dark sides and light spots (after Arnold, 1986a; Boulenger, 1917).

Distribution. Southern Yemen, Oman, United Arab Emirates, Qatar, adjoining Saudi Arabia to North of the Qatar Peninsula.

Habitat. Steppes with scarce vegetation (Fig. 3b).

References. Sindaco and Jeremčenko, 2008.

Mesalina ayunensis Arnold, 1980

Holotype. BMNH 1977.1169, male

Paratype. BMNH 1977.1168, female

Type locality: Ayun, Dhofar (Fig. 3a)

Diagnosis. As only two specimens are known, scale count is minimal. Up to at least 44 mm from snout to vent, quite slender, snout not very short, internasals in contact behind rostral, occipital scale very small or absent; lower eyelid with a number of enlarged, translucent, unpigmented scales in center. Dorsal scales 44, 47, gulars 32, 35 without a gular fold, ventrals in 10 longitudinal series, a clearly defined row of enlarged scales beneath lower foreleg; femoral pores 16, 18 on each side; scales on upper surface of tibia smooth and small, not obviously larger than dorsal scales between hind legs and meeting large scales on lower surface of tibia abruptly; 27, 28 strongly bicarinate lamellae beneath fourth hind toe. Dorsum generally uniform without dark flanks, tail bright blue in life; hemipenis not small (over 10% of snout-vent length when fully everted) (Arnold, 1980).

Distribution. Known only from Ayun, Dhofar, Oman.

Habitat. Rocky hillsides.

Mesalina bahaeldini Segoli, Cohen et Werner, 2002

Holotype. Zool. Mus., Hebrew univ. Jerusalem (HUU-R 10712)

Type locality: Near St. Catherine Monastery, Sinai, Egypt.

Eremias guttulata; Werner, 1973:20.

Mesalina bahaeldini: Segoli, Cohen et Werner, 2002.

Diagnosis. A prominent occipital in contact with the interparietal; curved collar; transparent disc of lower eyelid comprising two major scales, with black vertical bar; ventral plates in 10 straight longitudinal rows. Scales

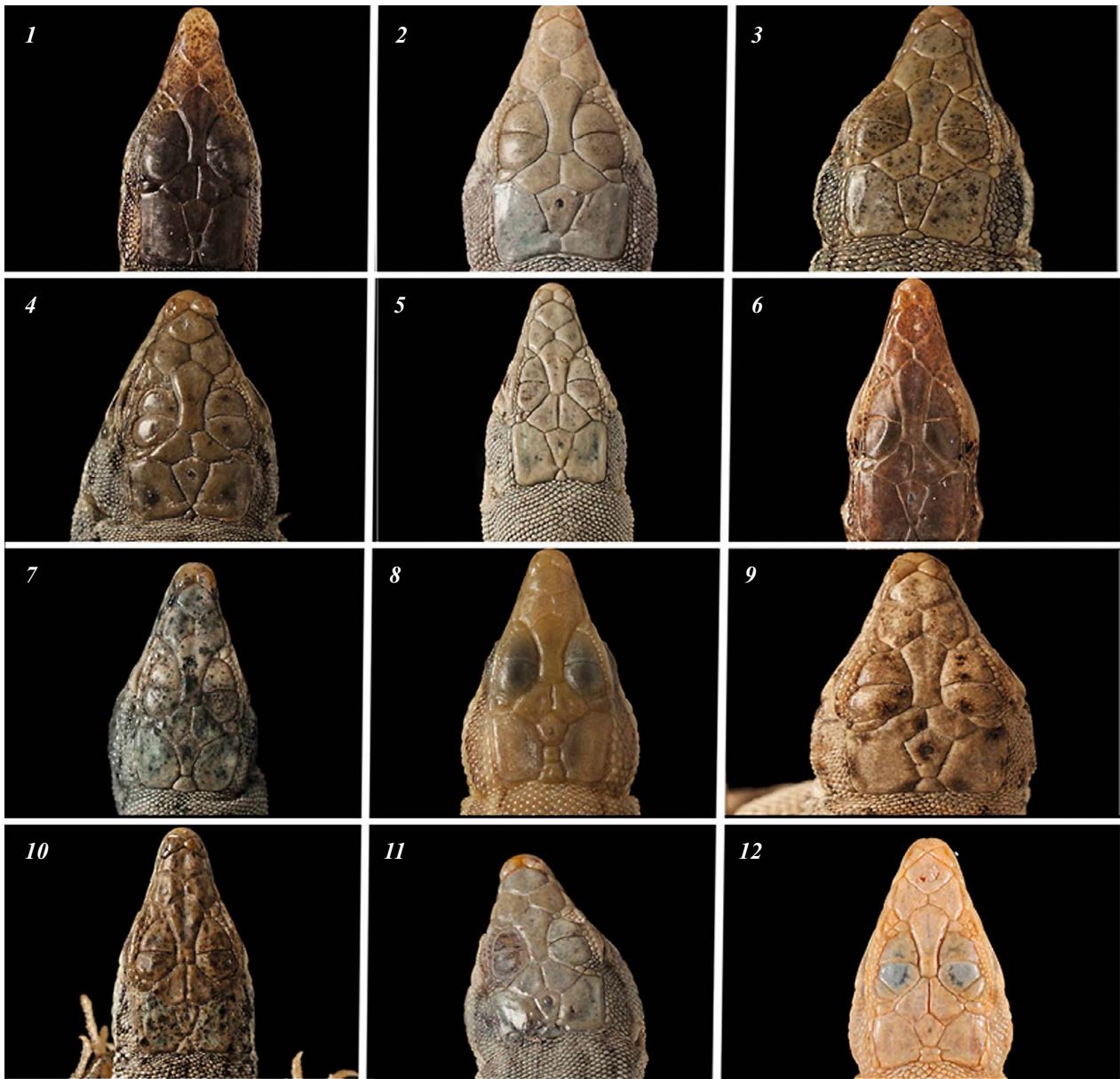


Fig. 1. Top of the head in 12 species of the genus *Mesalina*: 1, *M. adramitana*; 2, *M. ayunensis*; 3, *M. balfouri*; 4, *M. brevirostris*; 5, *M. guttulata*; 6, *M. martini*; 7, *M. olivieri*; 8, *M. pasteuri*; 9, *M. rubropunctata*; 10, *M. simoni*; 11, *M. watsonana*; 12, *M. ercolinii*.

on the upper surface of the tibia keeled. Lamellae under 4th toe, 21. Scales on ventral side of tail smooth. Dorsal coloration of adult brownish, with distinct longitudinal stripes (may be somewhat interrupted). Supralabials anterior to subocular 4; supralabials total 8 or 9; gulars, 22; plates in collar, 11. Dorsals across midbody, 45; ventrals across belly, 9; femoral pores, 11.

Distribution. This taxon is endemic to the mountains of southern Sinai, Egypt.

***Mesalina balfouri* (Blanford, 1881)**

Types: BMNH 81.7.22.8 – 11

Type locality: Yemen (Socotra Island, Darsa Island, Samha, Abd al-Kuri)

Eremias (Mesalina) balfouri, Blanf. Proc. Zool. Soc. London 1881, p. 467.

Eremias guttulata, part., Boulenger Cat. Liz., III, p. 87 (1887); Anders, Zool. Egypt, Bept. p. 174 (1898);



Fig. 2. Lateral view of the head in 12 species of the genus *Mesalina*: 1, *M. adramitana*; 2, *M. ayunensis*; 3, *M. balfouri*; 4, *M. brevirostris*; 5, *M. guttulata*; 6, *M. martini*; 7, *M. olivieri*; 8, *M. pasteuri*; 9, *M. rubropunctata*; 10, *M. simoni*; 11, *M. watsonana*; 12, *M. ercolinii*.

Boulenger in Forbes and Grant, Rep. Sokotra Exped. p. 84 (1903).

Eremias guttulata, var. *balfouri*, Boulenger J. Zool. Res. III, 1918, p. 10.

Diagnosis. The number of scales across midbody is 36 to 42; intermediate between those of typical form and *Mesalina olivieri*. Size is slightly larger than the typical form or any other species. Head is 1.5 times as long as broad. Nasals not very strongly swollen. The hindlimb

reaches the collar or between the collar and the ear in males; the elbow, the axil, or the shoulder in females. Frontonasal as long as broad or a little broader than long; frontal shorter than its distance from the end of snout and nearly always in contact with first supraocular; interparietal longer than frontoparietals; occipital small to very small. Collar free and composed of 7 to 9 plates. Ventral plates in 26 to 28 transverse rows in males, 28 to 31 in females. Preanal plate large in males, smaller in females,

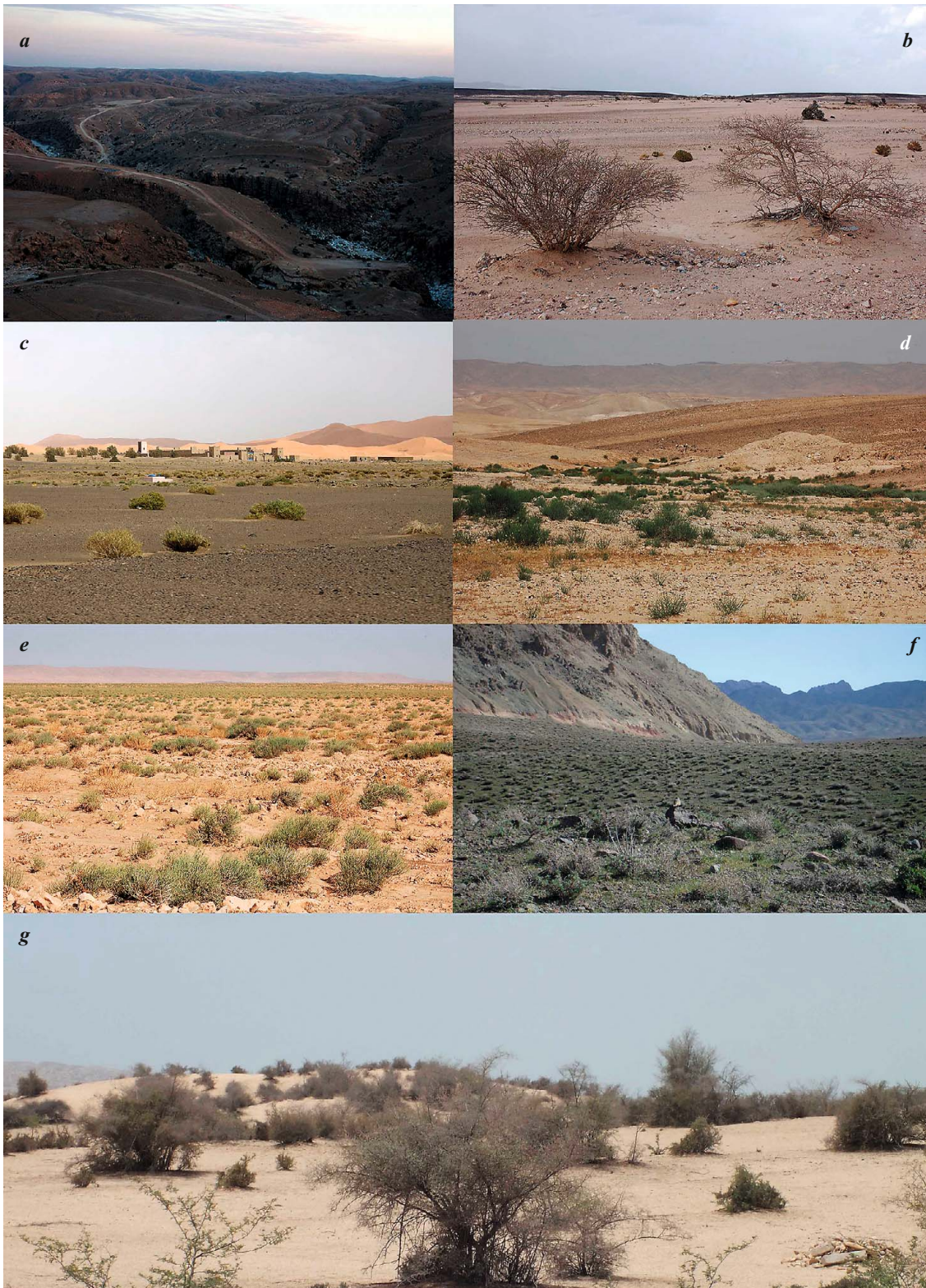


Fig. 3. Habitats of 7 species of the genus *Mesalina* from all distribution range: *a*, *Mesalina ayunensis* from Oman; *b*, *Mesalina adramitana* from Oman; *c*, *Mesalina rubropunctata* from Morocco; *d*, *Mesalina guttulata* from Palestine; *e*, *Mesalina olivieri* from Morocco; *f*, *Mesalina watsonana* from northeastern Iran; *g*, *Mesalina brevirostris* from southern Iran.

bordered by two semicircles of small plates. Femoral pores 11 to 15 on each side. Gray or brown above, usually with two white streaks on each side. A series more or less confluent black spots, or black and white ocelli along each side of back on the inner side of the light streak; these markings, as well as the light streaks, sometimes obsolete (Blanford, 1881; Bütikofer, 2012).

Distribution. Endemic to Socotra Archipelago in the Red Sea, Yemen.

Mesalina brevirostris Blanford, 1874

Syntypes: BMNH 80.11.10.40/1946.8. 6.34 and ZSI 3474; 1876:379 – 380.

Type locality: Tumb Island and Kalabagh, Punjab.

Mesalina brevirostris: Blanford, 1874b: 32 (Type locality: Tumb Island and Kalabagh, Punjab; syntypes: BMNH 80.11.10.40/1946.8. 6.34 and ZSI 3474; 1876:379 – 380.

Mesalina pardalis Blanford, 1876:377 – 379.

Eremias brevirostris: Boulenger, 1887a:89; 1921: 273 – 276; F. Werner, 1936:201; Schmidt, 1955:204; Hellmich, 1959:5; S. Anderson, 1968:333; 1974:38; 43. Schleich, 1977:127, 129.

Eremias brevirostris forma typical: Angel, 1936: 111 – 112.

Eremias brevirostris brevirostris: Haas and Werner, 1969:352 – 356, figs. 8B, 9B. Leviton et al., 1992:61 – 62, pl. 9D.

Diagnosis. Three nasals, lower in contact with rostral and first supralabial; ventral plates in 12 (rarely 10) straight longitudinal series; occipital absent or minute, not in contact with interparietal; collar curved or angular, free; head not strongly depressed, head width is 92% of head length; 51 – 53 scales across middle of back; 19 – 28 lamellae under fourth toe; moderately large lizard; snout-vent length 56 mm, tail 102 mm. Gray or grayish brown above, usually with numerous large whitish ocelli edged with black, pattern highly variable; sometimes small dark brown or rusty spots on back and larger ones on sides; tail with dark lateral spots; venter white (Blanford, 1874; Leviton et al., 1992).

Distribution. The species is distributed in Sinai, northern Saudi Arabia, Syria, Jordan, Iraq, southwestern Iran and islands in the Persian Gulf, Pakistan to Punjab, northern India (Fig. 3g).

Mesalina ercolinii (Lanza et Poggesi, 1975)

Holotype. MF (= Museo Zoologico dell'Università di Firenze) 5253.

Type locality: Bud Bud (about 4°12' N 46°28' E), 70 km S of El Bur, central Somalia.

Eremias ercolinii: Lanza et Poggesi, 1975.

Mesalina ercolinii: Lanza et Poggesi, 1975.

Diagnosis. Three nasals; frontal in contact with 1st, 2nd, and 3rd supraoculars; subocular does not contact lip; dorsal head shields nearly smooth; collar straight and free. Dorsal and ventral scales large, in 37 rows across body; scales imbricate and singly keeled at midbody, smooth on flanks; ventral plates in 8 straight longitudinal rows. Toes with three-keeled lamellae; base of tail covered by large and strongly imbricate scales, singly-keeled dorsally and smooth ventrally. Coloration (in preservative): dorsal overall hazel brown; head scalation finely dotted with dark brown or blackish tone; numerous dark brown scales on neck and trunk, some of latter being grouped in 2 paravertebral rows of 9 – 10 spots, each spot edged by 1 – 4 whitish scales laterally and sometimes by 2 – 3 similar scales medially; lateral whitish scales tend to form largely broken supraciliary stripe; irregular, narrow and indistinct brownish dorsolateral stripe extends from nape to base of tail; continuous whitish subocular stripe with brown edge that runs along neck, consists of 8 – 9 small irregular spots surrounded by some dark brown or blackish scales; limbs dorsally hazel brown; hindlimb has some small whitish, blackish-edged spots which are barely distinct on forelimb; ventrally ivory white (Lanza and Poggesi, 1975; Arnold et al., 1998).

Distribution. The species is distributed in Somalia and coasts of Indian Ocean.

Mesalina guttulata (Lichtenstein, 1823)

Syntypes: ZMB 1117 – 1120.

Type locality: Egypt.

Lacerta guttulata: Lichtenstein, 1823:101 (Type locality: Egypt and Numbia.)

Eremias guttulata: Duméril et Bibron, 1839:310.

Eremias guttulata: forma typical; Boulenger, 1921:258.

Eremias guttulata guttulata: K. P. Schmidt, 1939:65.

Mesalina guttulata: Szczerbak, 1974:273 (Type locality: Egypt).

Diagnosis. Occipital in contact with interparietal; curved collar; transparent disc of lower eyelid comprising two major scales, with black vertical bar; upper labials anterior to subocular usually 4, exceptionally 5. Ventral plates in 10 straight longitudinal rows. Scales on the upper surface of the tibia keeled. Lamella under 4th toe, 20 – 25. Scales on ventral side of tail smooth. Dorsal coloration of adult usually generally greyish, with more or less distinct black-and-white ocelli (or white dots flanked by black specks on one or either side), sometimes arranged in longitudinal or transverse rows. Key head

shields symmetrical. Supralabials, 9 or 10; gulars, 24; plates in collar, 11. Dorsal scales across midbody, 48; ventrals across belly, 10; transverse rows of ventrals, 30; subdigital lamellae, 22; femoral pores, 12 – 13 (Lichtenstein and Hinrich, 1823; Schleich, 1996).

Mesalina guttulata is a taxonomically a problematic species in North Africa and consists of two different clades probably separated by the Nile River (Kapli et al., 2008).

Other descriptions of the species in North Africa are referenced here: Baha el Din (2006) (based on 46 Egyptian specimens):

Snout fairly long, usually with 4 supralabials anterior to subocular; lower eyelid with window of 2 large transparent scales of roughly equal size, each clearly edged with black pigment; temporals small, smooth; tympanic shield obvious; dorsal scales medium-sized, granular or subimbricate; average number of dorsals at midbody 43 (range 39 – 45) and ventrals 10. Femoral pores 10 – 15.

Disi et al. (2001) and Segoli et al. (2002):

Small to medium-sized lizard with a relative long head and pointed snout, prominent nostrils; usually with an ocellated dorsal pattern. Occipital scale present. Palpebral disk distinct, composed mostly of 2 large, black edged transparent scales, forming a typical “window.” Dorsal scales very small, granular.

Distribution. Arid areas of North Africa from Morocco and Senegal to Egypt and Sudan, and of southwestern Asia from Sinai to Syria, Iraq and Aden (Fig. 3d).

Mesalina kuri Joger et Mayer, 2002

Holotype. HLMD-RA-2796-HT.

Type locality: Abd al-Kuri Island, Yemen, west coast.

Mesalina kuri: Joger and Mayer, 2002.

Diagnosis. A large-bodied *Mesalina*, with tail longer than twice snout-vent length; unkeeled scales on top of tibia; five or more slightly pigmented scales of equal size in palpebral disk of eyelid; a dorsal color pattern lacking continuous dark lines, with 44 – 52 dorsal scales rows. Seven lower and 8 upper labials on both sides. Number of transverse ventral scale rows 27 (counted from collar to groin); 46 dorsal scale rows around midbody; 16 scales under fourth finger, and 24 scales under fourth toe. Scales above eye: 2 large central and 2 medium-sized outer supraocular, accompanied distally by a row of smaller scales composed of 12 scales on the left and 9 scales on the right. Frontonasal scale in contact with rostral; parietals in contact with each other, although a large interparietal and a small triangular occipital scale are present. Femoral pores number 16 on each side. Dorsal surface of

head light brown; some black spots on the interparietal and parietals; lateral margins of parietals blackish. Sides of head whitish, with two dark lateral streaks, one from eye to upper ear opening and other from fifth supralabial to anterior ear opening. Dorsal color light grayish brown medially, with an alternating pattern of a row of small white spots, a row of small blackish spots, a thin white line, and a thin row of black streaks interrupted by small white spots from the vertebral area to the lateral fold. Venter and undersides of head and tail uniform whitish. Tail grey above, with a thin black vertebral line and a lateral row of black spots. Hind legs with ocellae-like white-centered spots; foreleg more or less uniform gray (Joger and Mayer, 2002).

Distribution. This taxon occurs only on Abd al-Kuri Island in the Socotra Archipelago, Yemen (Joger and Mayer, 2002).

Mesalina martini (Boulenger, 1897)

Type locality: Obok, Djibouti.

Eremias martini: Boulenger, 1897.

Eremias guttulata: Boulenger, 1898.

Eremias guttulata martini: Nennmann, 1905.

Diagnosis. Hind limbs reach the shoulder or the collar in males; the axil or shoulder in females. The ventral plates in 8 longitudinal series, the transverse series number 26 to 34. Femoral pores 10 to 14 on each side. Grey or pale brown above, with two or three dark stripes on each side, the broadest, proceeding from the eye, separated from the lower by a white streak, and from the upper (if present) by a white or pale streak; the dark streaks often with black and white spots or ocelli (Boulenger, 1897; Boulenger, 1921).

Distribution. Sinai Peninsula, Red Sea Province of the Sudan, Eritrea, Somaliland, and Aden (Boulenger, 1897).

Mesalina olivieri (Audouin, 1829)

Types: BMNH 1946.8.6.56 – 57.

Type locality: Egypt.

Lacerta olivieri: Audouin, 1829:175 (Type locality: Egypt).

Mesalina olivieri: Arnold, 1986a: 426.

Diagnosis. Small, short-headed and broad-snouted lizard that is sympatric with *M. guttulata* over much of its range. It was very common at the beginning of the 20th century but has been reduced in numbers by agricultural projects. It feeds on small insects, spiders, snails and mites, which form a substantial part of its diet in some places. In appearance it is similar to *M. simoni*. Ground

color is some variation of brown, from dark to beige, while the head may be silvery gray in old specimens. Dorsal pattern also varies on some arrangement of six longitudinal lines. Limbs are same color as body but with small spots. Lower flanks may be dotted with black. *M. olivieri* is active all year round but diurnal activity may extend into dusk during summer. It may also estivate (Audouin, 1829). It is found in a variety of habitats: flat terraces of open ground with stones and shrubs; sandy or loamy soils with *Frankenia thymifolia* and *Zygophyllum album*; Halfa grass steppes; and sandy regions with rocks in the Saharan region. Occipital scale well developed, four supraoculars of which 1st and 4th are small and divided. Nostrils rounded and protruding, situated between 3 scales one of which touches rostral. Frontal region somewhat bulging. Up to 7 supralabials; the 5th contacts the eye in 90% of specimens examined, the 6th and rarely the 7th in 10%. Four pairs of submaxillaries, of which anterior 3 are in contact. Gular fold and collar generally distinct. 35 to 50 (usually 40–47) smooth scales across middle of body. Eight longitudinal rows plus marginal row of half-sized plates on each side. Femoral pores 14–15 beneath each thigh. Males can be distinguished from females by the presence of a ventrally flattened tail base (rounded in females). Females deposit 2 or more clutches per year with 2–4 eggs per clutch: spermatogenesis is almost continuous but oviposition does not occur in mid-winter despite the lizards being active all year. This species may be somewhat longer-lived than comparable-sized lacertids.

Distribution. Southern Iraq, Jordan, Israel, northern Saudi Arabia (Hail and between Al-Gaisumah and Turaif); North Africa (Fig. 3e).

Mesalina pasteuri (Bons, 1960)

Holotype. MNHN 32.141.

Type locality: Amguit (Ahaggar).

Diagnosis. The distribution of this species is centered in central Sahara. This species is beige with one middorsal and two lateral white stripes on each side; the stripes are separated by narrow white or yellowish lines; ocelli are absent. The middorsal line continues for some distance onto the tail. Like *M. rubropunctatus*, *M. pasteuri* occupies the driest regions, but unlike the former species it does estivate. Another difference is its preference for mobile sands with tufts of grass and sand dunes, whereas *M. rubropunctatus* prefers stony, rocky areas. As with the latter species, population densities are extremely low. The lizards stay sheltered at noon during the summer months. Only small food items such as aphids, ants, termites and insect larvae are taken. *M. pas-*

teuri is eaten by a number of predators including scorpions, one species of wind scorpion, the Desert Monitor *Varanus griseus*, various snakes and crows. Diagnostic features include 4–5 (usually 5) supralabials in front of the subocular; 2 (sometimes 3 plus smaller) translucent scales, with 2–3 smaller ones on low anterior margins. Body with granular or subimbricate, smooth or slightly keeled scales in 34–41 rows at midbody; 10 longitudinal and 28–33 transverse rows. Large anal plate surrounded by two series of preanals. Femoral pores 10–14 beneath each thigh. Sexual maturity probably reached in 1 year (Bons, 1960).

Distribution. Known from Morocco, S Algeria, Niger, Mali and Sahara Desert in North Africa.

Mesalina rubropunctata (Lichtenstein, 1823)

Syntypes: ZMB 1115, 1116 (Egypt).

Type locality: “Aegypt et Nubia.”

Lacerta rubropunctata: Lichtenst., 1823, Verz. Doubt. Mus. Berl., p. 100.

Scapteria nebulosa: Gray, 1838, Ann. Nat. Hist. p. 281.

Mesalina lichtensteinii: Gray, 1838, Ann. Nat. Hist. 6:282; Dum. et Bibr., 1839, Erp. Gen. v, p. 297.

Mesalina rubropunctata: Gray, 1845, Cat. Liz. p. 43.

Diagnosis. Head and body rather strongly depressed. Head width is 83% of head length, its length 81% snout-vent length in males, 4 to 5 times in females, its depth equal to the distance between the center of the eye and tympanum; snout pointed, with the nasal shields strongly swollen, equal in length to the postocular part of the head; canthus rostralis sharp, loreal region feebly concave; a more or less distinct concavity in the middle of the upper surface of the snout, extending to the middle of the frontal shield. Neck as broad as head. Addressed hindlimb reaching the collar or between the collar and the ear, rarely the ear in males; the elbow, the axil, the collar, or a little beyond, in females; foot 92% of the length of head; toes moderately slender, not compressed. Tail 88% of the length of head and body. First and fourth supraoculars small or broken into granules; 6 to 8, rarely 5, superciliaries, first longest, separated from the two large supraoculars by one or two series of anterior granules and anterior, 2 to 5 posterior one, rarely one throughout. Three nasals, lower in contact with the rostral and the first upper labial, posterior small and very rarely excluded from the nostril; usually 4, sometimes 5, upper labials anterior to the subocular, which is keeled below the eye and largely borders the mouth, its lower border much shorter than the upper; temporal scales small, granular, lower larger; a small tympanic shield often present;

no auricular denticulation. Lower eyelid with a semi-transparent disc formed of 5 to 8 scales, 2 or 3 of which are sometimes large. 26 to 35 gular scales in a straight line between the symphysis of the chin-shields and the median collar-plate; dorsal scales juxtaposed, granular, smooth, larger towards the ventrals, 53 to 67 (usually 58 to 63) across the middle of the body. Ventral plates in 12, rarely 10 or 14, straight longitudinal rows, and 32 to 37 transverse series, mostly as long as broad or a little broader than long. Femoral pores 13 to 22 on each side, usually 14 to 20. Subdigital lamella bi-, tri-, or quadricarinate, usually 18 to 23 under the fourth toe. Upper caudal scales distinctly oblique; 26 to 32 scales in the fourth or fifth whorl. Sexual maturity may be reached in the second year. It also has been reported (Schleich et al., 1996) that the scorpion *Androctonus amoreuxi* is a major predator of the juveniles, which have been found with wounds inflicted by termite soldiers (Schleich et al., 1996). Food consists of ants and small Coleoptera, especially tenebrionids, although in captivity they will take crickets.

Distribution. Morocco, Libya, Algeria, and Egypt; generally in the Sahara Desert in N and W Africa as far as east as Sudan and Sinai (Fig. 3c).

Mesalina simoni (Boettger, 1881)

Type: SMF 6087.

Type locality: "inter urbes Mogador et Marocco, unicum prope urbem Casablanca."

Diagnosis. For a time it was considered a subspecies of *M. olivieri*: In appearance it differs mainly by a heavier pigmentation of dark gray on the gular and ventral regions, and by having light dorsal stripes bordered with black (this black bordering lacking in *M. olivieri*). Scalation is very similar to *M. olivieri* apart from the palpebral disk, which is made up of 7–8 opaque or translucent plates which are never bordered in black, unlike those of *M. olivieri*. This species inhabits rocky plateaus with sparse vegetation, from sea level to above 3000 ft. As it has only recently been differentiated from *M. olivieri*, details on ecology and reproduction are still lacking (Boettger, 1881).

Distribution. Limited to the Atlantic Coast in Morocco.

Mesalina watsonana (Stoliczka, 1872)

Syntypes: BMNH 74.4.29.1436/1946.8.7.75.

Type locality: between Karachi and Sukkur, Sind.

Eremias guttulata watsonana Stoliczka, 1872:86. (Type locality: Sind, between Karachi and Sukkur; syntypes BMNH74.4. 29.1436/1946.8.7.75, ZSI4929, 5050, 5223–5225, and NMW).

Mesalina pardaloides: Blanford, 1874b: 32. (type locality: Henjam Island, Persian Gulf; holotype: ZSI 3381); 1876:381.

Mesalina pardalis: Blanford, 1876:377–379.

Podarces (Eremias) watsonana: Bedriaga, 1879:33.

Podarces (Eremias) pardalis: Bedriaga, 1879:33.

Podarces (Eremias) pardaloides: Bedriaga, 1879:33.

Eremias pardaloides: Boulenger, 1887a: 87.

Eremias guttulata: Boulenger, 1887a: 87–89.

Eremias guttulata guttulata: S. Anderson, 1963:476.

Mesalina guttulata watsonana: Szczerbak, 1974: 275–277.

Mesalina guttulata: Leviton et al., 1992:62–63.

Mesalina watsonana: Arnold, 1986a: 1254. Frynta et al., 1997:10.

Mesalina watsonana: Clark, 1991:41.

Diagnosis. Three nasals, lower in contact with rostral and first supralabial; ventral plates in 10 (rarely 8) straight longitudinal series; small occipital present; larger transparent scales of lower eyelid edged with black. Collar complete or nearly so, its scales distinctly enlarged (Smith, 1935). Hemipenis relatively long, the basal parts of the lobes not folded, although the apical sections are; armature very elongate and cleft for most of its length with narrow clavulae; lips of sulcus strongly developed (Arnold, 1986). Grayish or olivaceous above; dorsum with longitudinal series of small white spots edged with black on flanks; often light dorsolateral stripe running to eye; limbs marbled with black and white; black streak on posterior aspect of thigh; venter whitish, some individuals from some localities having pale yellow throat and chest (Stoliczka, 1872).

Distribution. Occurs widely on the Iranian Plateau and extends as far north as southern Turkmenistan. It occurs throughout Iran and Afghanistan at elevation below 2500 m. In Iran it is absent only in the high mountains, along the Caspian coast, and in the Azerbaijan, Kurdistan, Kermanshah, and Ilam provinces. It appears to be absent from Turkey. Its distribution is largely complementary to that of *Ophisops elegans*, which appears to be its ecological counterpart to the northwest. The two species are sympatric over a large area of Iran, however (Anderson, 1999) (Fig. 3f).

RESULTS

Almost all known publications that contained information about species of *Mesalina* from local regions like Arabia, North Africa and Middle East were consulted, and we found that no one had prepared a comprehensive review of all 14 species in the genus or provided a general identification key (Arnold, 1986; Joger and Mayer,

2002; Segoli et al., 2002). In the previous section (*Material and Methods*) we described all 14 species of the genus *Mesalina* and explained about the source of photos.

Here we provide a new identification key for all species by comparing the photos and all known descriptions and papers on the species.

Genus *Mesalina* Gray, 1838

- 1a. Occipital scale absent or minute 2
- 1b. Occipital scale present 4
- 2a. Femoral pores between 10 – 14, ventral plates in 10 longitudinal rows and dorsal scales between 29 – 37 *Mesalina adramitana* (Boulenger, 1917)
- 2b. Dorsal scales more than 44 3
- 3a. Dorsal scales 44 – 47, femoral pores 16 – 18, ventral plates in 10 longitudinal rows *Mesalina ayunensis* Arnold, 1980
- 3b. Dorsal scales 51 – 53, femoral pores 15 – 19, ventral plates in 12 longitudinal rows *Mesalina brevirostris* Blanford, 1874
- 4a. Scales on tibia distinctly keeled 5
- 4b. Scales on tibia smooth or very slightly keeled 8
- 5a. One or more large transparent windows in palpebral disk 6
- 5b. Palpebral disk divided into several semi-transparent scales more or less equal in size 7
- 6a. 35 – 44 dorsal scale rows, maximum snout-vent length 58 mm *Mesalina balfouri* (Blanford, 1881)
- 6b. 43 – 47 dorsal scale rows, maximum snout-vent length 42 mm *Mesalina guttulata* (Lichtenstein, 1823)
- 7a. Broad dark band along middle of back present *Mesalina olivieri* (Audouin, 1829)
- 7b. Broad dark band along middle of back absent *Mesalina martini* (Boulenger, 1897)
- 8a. Ventral plates in 12 longitudinal rows, 53 to 67 (usually 58 to 63) across the middle of the body, color pattern distinctive *Mesalina rubropunctata* (Lichtenstein, 1823)
- 8b. Ventral plates in 10 or fewer longitudinal rows 9
- 9a. 5 supralabials anterior of the subocular; pattern completely lacking ocelli, characterized by longitudinal stripes; transparent area of the lower eyelid formed by 2 large scales (if 3rd is present, it is smaller); Sahara *Mesalina pasteuri* (Bons, 1960)
- 9b. 4 (sometimes 5; rarely in N Africa, more frequently in Middle East) supralabials anterior to the subocular; different pattern, often with ocelli 10
- 10a. Transparent area of lower eyelid (window) formed by 2 large scales, usually black edged (there can be others, but smaller); dorsal pattern usually with small ocelli *Mesalina watsonana* (Stoliczka, 1872)
- 10b. Transparent area of lower eyelid formed by 3 – 8 large scales, not clearly black edged; dorsal pattern consisting of dark and light stripes and small ocelli 11
- 11a. Transparent disc formed by 6 (rarely 7 – 8) dull scales, never black edged; throat and belly distinctly gray *Mesalina simoni* (Boettger, 1881)
- 11b. Transparent disc formed by less than 7 – 8 dull scales; throat and belly not distinctly gray colored 12
- 12a. Ventral plates in 10 longitudinal rows, 43 – 48 dorsal scales *Mesalina bahaeldini* Segoli, Cohen et Werner, 2002
- 12b. Ventral plates in 8 longitudinal rows 13
- 13a. 44 – 53 dorsal scales; 16 scales under fourth finger *Mesalina kuri* Joger et Mayer, 2002
- 13b. 37 dorsal scales, distributed in Somalia *Mesalina ercolini* (Lanza et Poggesi, 1975)

DISCUSSION

This revision is based on morphological characteristics. However, Baha el Din (2006) observed variation in pattern within the limits of Egypt; at higher elevations the populations tend to be darker and more strongly patterned than in the lowlands, while in the western Mediterranean coast the populations appear pale grayish and without pattern (*Mesalina brevirostris*). Apart from coloration, another difference mentioned by Schleich et al. (1996) is that the dark edges on the scales that form the palpebral disk are not present in all populations (*Mesalina brevirostris*). Some of these morphological differ-

ences likely were reflected in the results of the last genetic analysis (Kapli et al., 2008) in which indicated that not all of the 14 species described in this paper can be considered as valid species. These analyses show that *M. guttulata* is paraphyletic with respect to *M. bahaeldini*, while *M. brevirostris* proves to be a polytypic species or even a species complex, confirming previous studies (Baha el Din, 2006). The phylogenetic relationships among the *Mesalina* species remain unclear. Further research is needed to clarify the content of *Mesalina*, i.e., whether it actually contains 14 species. Considering the last genetic analysis and the vast geographic ranges of some of the recognized species (e.g. *Mesalina rubro-*

punctata, *Mesalina olivieri*), greater differentiation could be expected, as is the case in other reptiles with similar distributional patterns (e.g., *Eremias*, *Telescopus*, *Chalcides*, etc.) (Rastegar-Pouyani et al., 2010).

Present keys dealing with the world's herpetofauna often are limited to small areas (like Middle East, North Africa, Sinai, Arabia, etc.) (Blanford, 1881; Boulenger, 1897; Boulenger, 1917; Bons, 1960; Arnold, 1973; Lanza and Poggesi, 1975; Arnold, 1977; Mayer and Benyr, 1995; Joger and Mayer, 2002; Segoli et al., 2002), while others are restricted to a few species from a single genus (Arnold, 1986; Joger and Mayer, 2002; Segoli et al., 2002). Gathering data for all species of *Mesalina* was performed by reviewing the papers with the original descriptions of each species and photos of 12 out of 14 recognized species. The present key is very useful in covering the distributional range of the genus *Mesalina* from North Africa, Middle East, and Arabia to Pakistan and Iran.

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