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A new lizard of the genus *Mesalina* from Mt. Sinai, Egypt (Reptilia: Squamata: Sauria: Lacertidae)*

With 7 Tables and 9 Figures

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Kurzfassung. **Eine neue Eidechse der Gattung *Mesalina* vom Mt. Sinai, Ägypten (Reptilia: Squamata: Sauria: Lacertidae).** – Eine *Mesalina*-Population aus dem Gebirge der südlichen Sinai-Halbinsel wird als neue Art, *M. bahaeldini* n. sp. beschrieben. *M. bahaeldini* ähnelt *M. guttulata* in konventionellen Schlüsselmerkmalen. Konsistente Unterschiede existieren in folgenden Merkmalen: Färbung gestreift (statt ozelliert) und bräunlich (statt grau getönt); im Durchschnitt weniger Supralabialia; quer über die Körpermitte gezählt weniger Dorsalia; weniger Ventralia-Querreihen; weniger Subdigital-Lamellen unter der 4. Zehe; dennoch längere Zehen relativ zur Hinterbeinlänge; einzelne Subdigital-Lamellen relativ zur Körpergröße länger. Die Serie von neun Syntypen von *Lacerta guttulata* LICHTENSTEIN, 1823 aus dem Zoologischen Museum Berlin, von HEMPRICH und EHRENBERG in Ägypten und Nubien gesammelt, ist heterogen und enthält nur sechs Exemplare, die mit der Artbeschreibung übereinstimmen. Daher wird ein Lectotypus designiert und eine Redeskription der Art vorgestellt. Die endemische *M. bahaeldini* und die weitverbreitete *M. guttulata* sind geographisch zwar sympatrisch, meist jedoch nicht syntop. *M. bahaeldini* kommt über 600-1000 m NN vor, *M. guttulata* in zahlreichen verschiedenen Höhenlagen, wobei das Vorkommen in identischen Höhenlagen unklar bleibt.

Abstract. A population of *Mesalina* on the mountains of the southern Sinai peninsula is described as a new species, *M. bahaeldini* n. sp. *Mesalina bahaeldini* resembles *M. guttulata* in conventional key characters but differs from it in consistently being striped (rather than ocellated) and brownish (rather than greyish); having on average fewer supralabials; fewer dorsals in a transverse count at midbody; fewer transverse rows of ventral plates; fewer subdigital lamellae under the fourth toe; but longer toes, relative to hindlimb length; individual subdigital lamellae are longer, relative to body size. The series of nine syntypes of *Lacerta guttulata* LICHTENSTEIN, 1823, in the Zoologisches Museum, Berlin, collected by HEMPRICH and EHRENBERG in Egypt and Nubia, is heterogeneous, only six fitting the description of the species. Therefore a lectotype is designated and the species redescribed. The endemic *M. bahaeldini* and the widespread *M. guttulata* are geographically sympatric but usually not syntopic. The former occurs only above 600-1000 m a.s.l., the latter at a wide range of altitudes but its occurrence at the same high altitudes is unclear.

Key words. Reptilia, Squamata, Sauria, Lacertidae, *Mesalina bahaeldini* n. sp., *Mesalina guttulata*, lizard, mountains, HEMPRICH & EHRENBERG, sexual dimorphism, Egypt. Sinai.

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Introduction

The lacertid genus *Eremias* was divided by BOULENGER (1921) into "sections"; his section *Mesalina* was given generic status by SZCZERBAK (1974), who included in it six species distributed in southwestern Asia and northern Africa, which are jointly distinguished by having the ventral plates in rows paralleling the midline.

In the Sinai Peninsula, Egypt, four species of *Mesalina* are well known: *M. brevirostris, M. guttulata, M. olivieri* and *M. rubropunctata* (WERNER 1973, 1982, SALEH 1997). These species, of similar size, differ in pholidosis and coloration and are easily identified (BONS & GIROT 1962, WERNER 1973: Appendix, SALEH 1997, Fig. 1). Of these species, *M. brevirostris* occurs only in the extreme southern tip of the peninsula, *M. guttulata* is widespread throughout Sinai on firm or rocky soils, *M. olivieri* lives on sandy soils, hence occurs widely in the north of the peninsula and around its circumference, and *M. rubropunctata* is known only from a few points scattered throughout Sinai (WERNER 1973 and unpublished data in the Hebrew University collection, SALEH 1997).

But the collection of the Hebrew University of Jerusalem contains some specimens of *Mesalina* from the south Sinai mountains, that, while defined as *M. guttulata* by all key characters, markedly deviate in both pattern and colour (Fig. 2). These specimens, collected by Hebrew University research teams in 1956-57 and 1967-1982 (when Sinai was administered by Israel), are striped rather than ocellated, and brown rather then grey. Their uniqueness was noticed already in the field (WERNER 1973). A cursory search of other museums revealed additional specimens of the same coloration from the same area, which everywhere had been identified as *M. guttulata*.

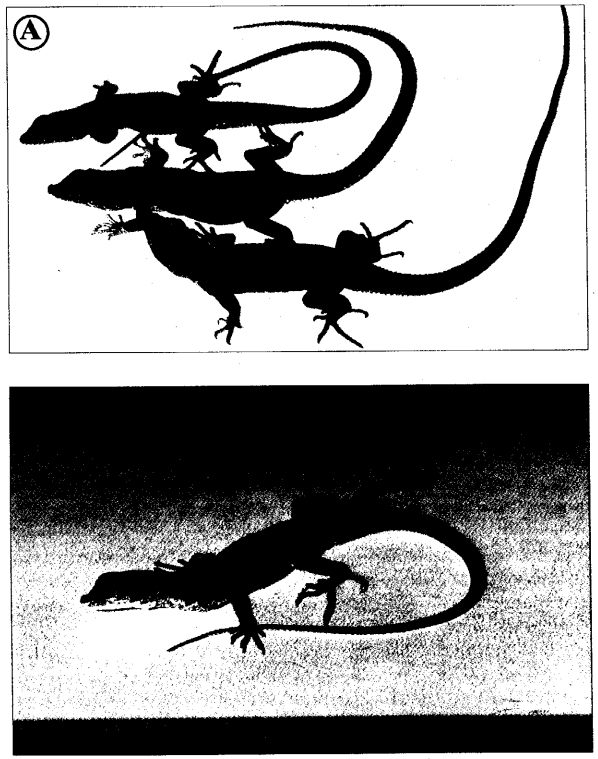

Fig. 1: The four species of *Mesalina* formerly known from Sinai. (A) From top to bottom: *M. olivieri* (from Mishor Rotem, Israel), *M. rubropunctata* (S shore of Murrah As Sughra, Sinai, Egypt), *M. guttulata* (Judean Desert, Israel). (B) *Mesalina brevirostris* (Nabq, Sinai. Egypt).

In this paper we examine these "striped *Mesalina guttulata*" and conclude that they represent a new species, which we describe. As a prerequisite to its description we examined the syntypes of *Mesalina guttulata* (LICHTENSTEIN, 1823). It transpired that this type series was heterogeneous, necessitating our designation of a lectotype and redescription of the species. In our descriptions we present only those synonyms which show the development of the current names; further synonyms are listed in ANDERSON (1898) and BOULENGER (1921).

Material and Methods

Abbreviations

♀	female
♂	male
juv.	juvenile
percra	Percents of ra (WERNER 1971)
ra	Rostrum-anus length (WERNER 1971)
W.	Wadi
BMNH	Natural History Museum, London
FMNH (CNHM)	Field Museum of Natural History, Chicago
HUJ-R	Zoological Museum, Hebrew University of Jerusalem, Herpetology
MTD	Museum für Tierkunde Dresden
NMP6V	National Museum (Natural History), Prague
ZMB	Zoologisches Museum, Humboldt Universität, Berlin

Summary of material

We examined the specimens of "striped *M. guttulata*", listed and described below as the type series of the new taxon (n = 30; 28 for mensural characters). Data for a control group of "normal *M. guttulata*" from the area of sympatry (n = 21; 17 for mensural characters; Appendix 1) were derived from a larger pre-existing data base (KOSSWIG et al. 1976), which also provided information on sexual dimorphism in *M. guttulata* (Tab. 1). In the listings of specimens, those used for mensural characters (i. e., adults), are identified by an asterisk (*). Further we had at our disposal assorted field notes and photographs, including colour diapositives, of live lizards and radiographs of museum specimens, of both "morphs". We examined the syntypes of *Lacerta guttulata* LICHTENSTEIN, 1823 (n = 9).

Fig. 2: Top, *Mesalina bahaeldini* n. sp., ♀ (from the peak of Jabal Sirbal, Sinai, Egypt); bottom, *Mesalina guttulata*, ♀ (Be'er Mash'abbim, Negev, Israel).

Character	N		Mean		P
	Males	Females	Males	Females	
ra (mm)	29	24	43.0	44.3	0.19
Head length	21	18	23.9	21.6	0.00
Head width	21	18	14.6	14	0.94
Head depth	21	18	11.1	9.9	0.003
Forelimb length	20	18	35.3	32.5	0.00
Hindlimb length	21	18	63.9	56.8	0.00
Fourth toe length	21	18	28.1	24.8	0.00
Tail length	13	3	196.3	183.3	0.48
Head index	21	18	164.6	154.6	0.04
Scales across back	29	24	47.5	47.6	0.87
Scales across belly	29	24	9.6	9.2	0.18
Gular scales	29	23	24.2	22.8	0.01
Scales, ventralia	29	24	30.6	31.7	0.02
Supralabialia	29	24	10.5	10	0.85
Femoral pores	28	22	12.9	12.7	0.84

Tab. 1: Sexual dimorphism in Mesalina guttulata from the Negrev (Israel) and Sinai (Egypt). Measurements in percra (except ra and head index). P, significance of the difference between males and females.

Characters

Where possible, we examined the following mensural, meristic (pholidotic and osteological), computed and qualitative characters in all specimens investigated.

Mensural characters

Except for ra and tail length, which were measured to the nearest 0.5 mm, all characters were measured to the nearest 0.1 mm. Except ra, all are presented as percra.

Rostrum-anus length (ra): Distance from tip of snout to cloaca.
Head length: Distance from tip of snout to the posterior edge of the ear, measured parallel to long axis of body with special callipers (GOREN & WERNER 1993).
Head width: Greatest width of head.
Head depth: Greatest depth of head.
Forelimb length: From axilla to tip of distal claw.
Hindlimb length: From groin to tip of distal claw.
Fourth toe length: From insertion of 5th toe, claw included.
Tail length: From cloaca to tip of tail, if original.

Meristic pholidotic characters

We examined certain meristic characters bilaterally and compared the right and left sides, testing for possible directional asymmetry (WERNER et al. 1991). These characters are indicated by an asterisk (*) in the character list below.
*Supralabials, total: Number of supralabials from the most posterior clearly enlarged plate, to (excluding) the rostral, including the suborbital.
Gulars: Number of gular scales in a straight median series.
Plates in collar: Number of larger scales in collar.
Dorsals: Number of dorsal scales across midbody.
Ventrals across belly: Number of ventral scales in longest row across belly.
*Transverse rows of ventrals: Number of transverse series of ventral scales, counted along the ventral side to (and excluding) the level of the femoral pores.
*Femoral pores.
*Subdigital lamellae: Along underside of fourth toe, defined by their width, the one touching the claw included.

Meristic osteological characters

New material of both morphs was radiographed with a Faxitron X-ray Corp. Cabinet X-ray System, at 22 kV, 30 s, on polaroid film. The sample of the ocellated morph was enhanced with some radiographs from elsewhere in Sinai and the Negev on file. Because the quality of some radiographs precluded the certain identification of rib types, we counted vertebrae only in two broad regions of the vertebral column: precaudal vertebrae, total; and caudal vertebrae (if complete), total.

Computed characters

Head index = 100 x Head length divided by head width. Toe index = 100 x fourth toe length divided by total hindlimb length. Lamella percra = fourth toe length in percra divided by the number of subdigital lamellae under that toe.

Geographical names and Mapping

As far as possible, geographical names in Egypt are spelled following the U.S. BOARD OF GEOGRAPHIC NAMES (1959) and those elsewhere follow the TIMES ATLAS (1997). Topographical co-ordinates in Sinai refer to the Israel Grid, in 6 digits to the nearest km or in 8 digits to the nearest 0.1 km. The maps of locality records within the survey area of Israel and Sinai (WERNER 1988) were prepared according to the manual method described by WERNER (1977). The map of *Mesalina guttulata* is based on the specimens in HUJ-R; the map of the new species is based on the type material listed here.

Results

Research strategy

First we tested for each of the two coloration morphs the symmetry of the four characters examined bilaterally. There was no significant asymmetry. Therefore we present here only the counts on the right side.
Next, because of the widespread sexual dimorphism in Lacertidae generally (BÖHME 1981) and in *Eremias* (PETERS 1964), we verified in the pre-existing data base that in *Mesalina guttulata* several mensural and two meristic characters were indeed sexually dimorphic (Tab. 1). Thereupon we investigated the mensural characters separately in males and females, and ex-

Character	Percra (Mean, SD, Range)			P
	M. bahaeldini	*M. guttulata*	Syntypes	
ra (mm)	45.2 ± 2.84	46.1 ± 4.11	42.0 ± 1.0	0.57
	43.0 - 52.0	40.0 - 52.0	41.0 - 43.0	
Head length	24.36 ± 0.90	23.66 ± 1.86	27.39 ± 1.00	0.29
	23.02 - 26.14	21.59 - 26.96	26.98 - 28.54	
Head width	15.94 ± 3.85	15.18 ± 1.66	16.37 ± 1.69	0.54
	14.11 - 27.53	12.69 - 17.75	15.12 - 18.29	
Head depth	11.17 ± 0.71	10.69 ± 0.64	12.23 ± 1.36	0.11
	10.32 - 11.96	9.62 - 11.60	10.95 - 13.66	
Head index	158.08 ± 24.63	157.70 ± 22.18	168.05 ± 11.32	0.97
	148.65 - 192.19	125.35 - 193.94	156.00 - 178.46	
Forelimb length	34.58 ± 1.64	34.01 ± 2.95	36.53 ± 1.61	0.59
	31.82 - 37.21	29.79 - 40.00	34.88 - 38.10	
Hindlimb length	58.47 ± 3.69	61.49 ± 6.36	62.66 ± 4.08	0.21
	51.92 - 65.12	51.92 - 71.25	60.98 - 69.05	
4th toe length	27.32 ± 1.83	26.70 ± 3.80	30.13 ± 2.13	0.65
	23.91 - 30.59	22.83 - 33.75	28.57 - 32.56	
Toe index	46.85 ± 3.69	43.34 ± 2.76	46.76 ± 4.88	0.02
	37.93 - 51.85	36.84 - 47.37	41.38 - 50.91	
Tail length	207.10 ± 22.42	210.62 ± 23.06		0.87
	180.23 - 238.82	194.31 - 226.92		

Tab. 2: Comparison of mensural characters among male *Mesalina bahaeldini* n. sp. (n = 12; 6 for tail length), sympatric *M. guttulata* (n= 10; 2 for tail length) and syntypes of *M. guttulata* (n= 3; 0 for tail length). Measurements in percra (except ra, head index and toe index). P, significance of the difference between the *M. bahaeldini* and *M. guttulata* samples.

cluded the juveniles which could bias body proportions; for the meristic characters we initially (see below) pooled the sexes and ages.

All specimens of "*Mesalina guttulata* sensu lato" were either brown and striped or grey and ocellated, and no intermediate individuals occurred. In order to decide, whether these are two conspecific morphs or two sympatric species, we tested for additional correlated differences. Since the conventional preservation of reptilian museum specimens involves fixation with formalin, genetic comparisons were precluded. We compared the quantitative morphological characters (listed above) of the two groups by univariate statistics. The results included several significant differences between the two coloration morphs, despite the small samples. Of the ten mensural characters, only one, toe index, differed between the morphs, and this was significant only in the males (Tab. 2-3). But of the eight pholidotic characters, four differed significantly between the morphs, when these were

Character	Percra (Mean, SD, Range)			P
	M. bahaeldini	*M. guttulata*	Syntypes	
ra (mm)	43.2 ± 4.75	45.0 ± 2.36	42.0 ± 0.71	0.36
	37.0 - 50.0	40.5 - 47.0	41.5 - 42.5	
Head length	22.26 ± 1.54	21.89 ± 1.24	24.51 ± 1.94	0.62
	19.60 - 24.11	19.77 - 23.33	23.13 - 25.88	
Head width	14.59 ± 0.48	14.61 ± 1.22	13.58 ± 0.90	0.98
	13.60 - 15.24	12.34 - 15.80	12.94 - 14.22	
Head depth	10.95 ± 0.82	10.32 ± 1.06	10.01 ± 0.84	0.22
	10.22 - 12.70	8.18 - 11.36	9.41 - 10.60	
Head index	152.42 ± 7.38	150.61 ± 13.63	181.36 ± 26.37	0.76
	143.94 - 166.04	129.85 - 175.86	162.71 - 200	
Forelimb length	33.29 ± 1.99	32.15 ± 2.12	33.37 ± 3.93	0.31
	30.43 - 35.71	29.79 - 35.80	30.59 - 36.14	
Hindlimb length	56.34 ± 4.21	56.81 ± 3.81	57.18 ± 4.33	0.83
	48.89 - 61.90	54.26 - 62.96	54.12 - 60.24	
4th toe length	26.74 ± 1.77	26.13 ± 2.66	26.82 ± 4.66	0.61
	23.00 - 28.57	23.40 - 29.63	23.53 - 30.12	
Toe index	47.63 ± 3.89	45.98 ± 3.45	46.74 ± 4.61	0.4
	41.07 - 54.55	43.14 - 53.06	43.48 - 50	
Tail length	212.48 ± 9.99	206.48 ± 12.83	216.87	0.32
	204.26 - 224.66	205.55 - 207.40		

Tab. 3: Comparison of mensural characters among female *Mesalina bahaeldini* n. sp. (n= 8; 5 for tail length), sympatric *M. guttulata* (n= 7; 3 for tail length) and syntypes of *M. guttulata* (n= 2; 1 for tail length). Measurements in percra (except ra, head index and toe index). P, significance of the difference between the *M. bahaeldini* and *M. guttulata* samples.

compared without distinction of sex or age (Tab. 4). Because two of the pholidotic characters were known for sexual dimorphism (Tab. 1), these were also tested for separate sexes: The number of gulars (greater in males) did not differ significantly between the morphs when tested for pooled sexes (Tab. 4), for males (P = 0.21) or for females (P = 0.87). The number of transverse rows of ventrals (greater in the females) differed significantly between the morphs, when the samples comprised the pooled sexes (Tab. 4). When each sex was tested separately, the difference between the morphs was insignificant (males, P = 0.098; females, P = 0.42).

Because the striped morph had longer toes than the ocellated morph, but nevertheless fewer subdigital lamellae than the latter, we computed Lamella percra = fourth toe length in percra divided by the number of subdigital lamellae under that toe. This combination character differed significantly between the females of the two morphs (Tab. 5).

Character	Mean, SD, Range			P
	M. bahaeldini	*M. guttulata*	Syntypes	
Supralabials	9.3 ± 0.76	10.5 ± 1.21	9 ± 0.71	0.0006
	8 - 11	8 - 13	8 - 10	
Gulars	22.2 ± 1.68	22.5 ± 1.83	25 ± 2.35	0.567
	18 - 25	19 - 26	23 - 29	
Plates in collar	11.2 ± 0.73	11.4 ± 0.81	10.2 ± 1.1	0.382
	10 - 12	10 - 13	9 - 11	
Dorsals	43.9 ± 2.5	46 ± 2.97	45.4 ± 4.56	0.012
	39 - 49	40 - 51	41 - 50	
Ventral across belly	9.9 ± 0.49	10 ± 0.63	10 ± 0	0.535
	8 - 11	9 - 12	10	
Transverse rows of ventrals	30.1 ± 1.80	31.5 ± 1.78	29.6 ± 4.28	0.0104
	26 - 34	28 - 36	24 - 36	
Femoral pores	12.7 ± 1.15	12.9 ± 1.07	12.6 ± 0.55	0.533
	10 - 14	11 - 15	12 - 13	
Subdigital lamellae	21.4 ± 0.72	22.6 ± 1.25	21.8 ± 1.64	0.0001
	20 - 23	20 - 25	20 - 23	

Tab. 4: Comparison of meristic characters among *Mesalina bahaeldini* n. sp. (n= 30; 29 and 28 for the two counts of ventrals), sympatric *M. guttulata* (n= 21) and syntypes of *M. guttulata* (n= 5). P, significance of the difference between the *M. bahaeldini* and *M. guttulata* samples.

The number of precaudal vertebrae (included in Tab. 6-7) did not differ between the morphs. In summary the two qualitative coloration morphs, which discontinuously differed in both colour and pattern, also significantly differed (at least in one sex) in six quantitative characters, so that they warranted taxonomic recognition. Because geographically they were sympatric (see below, Fig.8), we considered them to be separate species. But because both species fit the traditional key definition of *Mesalina guttulata*, it was necessary to ascertain which of the two matched the original description and the type series, and should retain the original name.

The syntypes and original description of *Mesalina guttulata* (LICHTENSTEIN, 1823)

The type series of *Lacerta guttulata* LICHTENSTEIN, 1823, in the ZMB, collected by HEMPRICH & EHRENBERG's expedition to northeastern Africa, 1819-1826 (STRESEMANN 1954), comprises nine specimens and is heterogeneous both in characters (coloration and some of the key characters) and in geographical origin. Its interpretation in terms of currently recognised taxa, and of eligibility for designation of a lectotype, is not simple.
LICHTENSTEIN's description expressly specifies a coloration with black and white dots and gives the area of origin as Egypt and Nubia. Only six of the syntypes posses or appear to have possessed, the ocellated or black-and-white dotted coloration: three of the four which are catalogued "Egypt" (ZMB 1117, 1119, 1120), the two catalogued "Nubia" (ZMB 1121,

Sex	N		Percra (Mean, SD, range)		P
	M. bahaeldini	*M. guttulata*	*M. bahaeldini*	*M. guttulata*	
Males	12	10	1.29 ± 0.19	1.18 ± 0.17	0.1
			1.09 - 1.46	1.24 - 1.38	
Females	6	8	1.29 ± 0.06	1.15 ± 0.11	0.01
			1.00 - 1.47	1.02 - 1.31	

Tab. 5: Comparison of the combined character "lamella percra" between the *M. bahaeldini* and *M. guttulata*. P, significance of the difference between the *M. bahaeldini* and *M. guttulata* samples.

631344), and the one catalogued "Sinai" (which at that time, as now, was part of Egypt) (ZMB 1062). The fourth specimen catalogued from "Egypt" (ZMB 1118), although possessing most key characters of *M. guttulata*, deviates in having a conspicuous striped coloration and in other ways, and will be dealt with elsewhere. Finally, two specimens catalogued "Suez" (ZMB 1122, 63004) have a semi-striped coloration (quite different from that of the specimens from the Sinai mountains) but a typical *guttulata*-type lower eyelid. These two probably cannot be interpreted without a thorough study of the relationships of *M. guttulata* and the *M. olivieri* complex (HAAS 1951), which in Israel appear to sometimes hybridise (WERNER, unpublished).
According to STRESEMANN's (1954: 170-171, 177) listing of the shipments from the HEMPRICH & EHRENBERG expedition, the type material of *Eremias guttulata* (LICHTENSTEIN, 1823) consisted of (or included?) five individuals from "Tscheile (el Achderieh) et Siva", which were part of the third shipment (shipping numbers 18, 25, 34-36). This shipment comprised material collected in 1820-21, and reached Berlin in 1821. But from the sequence of letters sent by the expedition (STRESEMANN 1954: 8-10) in combination with the above listing of shipments, it appears that also material collected in Nubia (seventh shipment) did reach LICHTENSTEIN in time to be included in his 1823 treatise. In contrast, from the same sources it seems highly unlikely that the expedition's material from Suez and Sinai could have reached LICHTENSTEIN in time for inclusion.
We conclude that it is most probable that LICHTENSTEIN based his *Lacerta guttulata* on the ocellated specimens from Egypt and Nubia, totalling five. We designate a relatively well-preserved female from Egypt as lectotype. The type locality is discussed below within the redescription of the species. This redescription is desirable also because in the literature the variation described for *M. guttulata* has included the characteristics of *M. olivieri* not only until HAAS (1951) distinguished these two species but sometimes also later (e. g., MARX 1968).

Redescription of *Mesalina guttulata* (LICHTENSTEIN, 1823)
(Figures 1-3, 8)

Lacerta guttulata LICHTENSTEIN, 1823: p. 101. (Type locality: Egypt and Nubia.)
Eremias guttulata; DUMÉRIL & BIBRON, 1839: p. 310.
Eremias guttulata forma typica; BOULENGER, 1921: p. 258.
Eremias guttulata guttulata; K. P. SCHMIDT, 1939: p. 65.
Mesalina guttulata; SZCZERBAK, 1974: p. 273. (Type locality: Egypt).

Lectotype: Adult female ZMB 1119 with apparently complete tail, collected in 1820-21 by the W. HEMPRICH & C. G. EHRENBERG expedition to the Near East.

Type locality: "Aegypt. et Nubia" (LICHTENSTEIN 1823), retained by FLOWER (1933) but restricted to Egypt by SZCZERBAK (1974) and accepted by ARNOLD (1986) and LEVITON et al. (1992), perhaps because according to STRESEMANN (1954: 177) the syntypes were from "Tscheile (el Achderieh) et Siva", both in Egypt. The first locality, also spelled "Dsheil el Achderieh" (STRESEMANN 1954: 8), we failed to locate even on JACOTIN's (1818) 1:100,000 map, although Hemprich defined it as "3 hours from Alexandria" [presumably by camel caravan, to southwest towards Derna, Libya, the beginning of the way to Cairo] (STRESEMANN 1954: 17). The second locality presumably refers to the Siwa oasis at 29°10'N 25°30'E. We do not know from which of the two localities the lectotype came but we may now restrict the type locality to "Lower Egypt (near Alexandria or Siwa)".

Paralectotypes (4): ZMB 1117 ♂, 1120 ♂, from Egypt; ZMB 1121 ♂, 63144 ♀ from Nubia; all collected in 1820-21 by the W. HEMPRICH & C. G. EHRENBERG expedition to the Near East.

Diagnosis: A *Mesalina* with an occipital in contact with the interparietal; curved collar; transparent disc of lower eyelid comprising two major scales, with black vertical bar; upper labials in front of the subocular usually 4, exceptionally 5. Ventral plates in 10 straight longitudinal rows. Scales on the upper surface of the tibia keeled. Lamellae 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 ordered in longitudinal or transverse rows.

Description of the lectotype: Slightly shrunken specimen, female with "hunger folds"; relatively delicate lacertid proportions, neck almost as wide as head and almost as wide as shoulders.

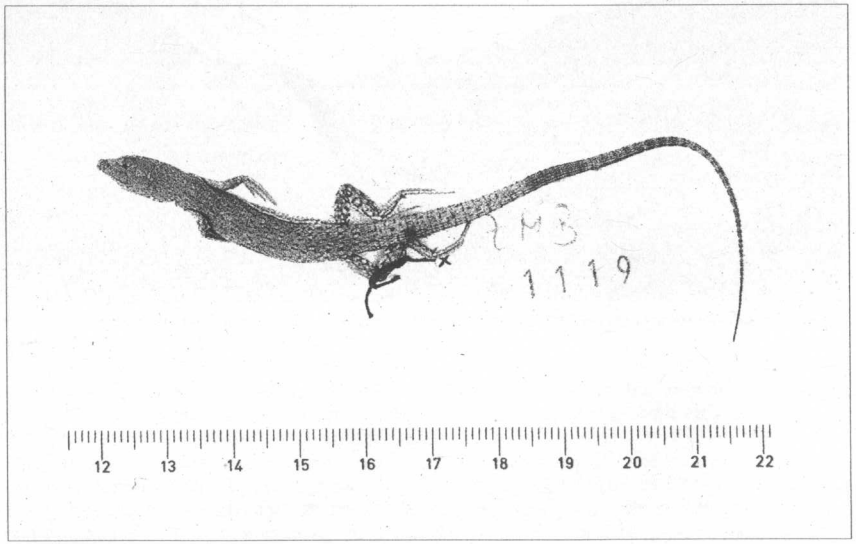

Fig. 3: The lectotype of *Mesalina guttulata* (ZMB 1119).

Measurements: ra, 41.5 mm; head length, 9.6 mm (23.1 percra); head width, 5.9 mm (14.2 percra); head depth, 4.4 mm (10.6 percra); head index, 162.7; forelimb length, 15.0 mm (36.1 percra); hindlimb length, 25.0 mm (60.2 percra); fourth toe length, 12.5 mm (30.1 percra); toe index, 50; tail length (complete) 90.0 mm (216.9 percra).
Pholidosis (where relevant: L, R): The window in the lower eyelid is divided by a black vertical bar. Key head shields symmetrical. Supralabials, total, 9, 10; supralabials anterior to the suborbital, 4, 4; gulars, 24; plates in collar, 11. Dorsals across midbody, 48; ventrals across belly, 10; transverse rows of ventrals, 30, 30; scales on the dorsal side of the tibia moderately keeled; subdigital lamellae, 22, 21; femoral pores, 13, 12;
Coloration in alcohol: Numerous small incomplete ocelli, each formed of a circular whitish dot, framed left and right by somewhat longitudinal blackish dots. These ocelli form about 8 irregular longitudinal series and about 16 very irregular transverse series, between fore- and hindlimbs; they further extend to the base of the tail and to the hindlimbs. On the neck and small-scaled part of the head they are represented by small black-and-white dots. The pileus is plain creamy-grey. On the sides of the head 3 vertical bars are indicated - preceding the eye, through the eye, and behind the eye. The ventral side is creamy-white, immaculate.

Variation: Quantitative variation (mensural and meristic) in the type series (n = 5) is summarised in Tables 2-4. In qualitative characters the paralectotypes differ from the lectotype as follows: ZMB 1117, no black bar discernible in the lower eyelid; ZMB 1120, the black bar in the lower eyelid is barely indicated, and the tibials are only feebly keeled. The coloration of ZMB 1117 resembles that of the lectotype but many of the ocelli are almost complete, the white dots being almost completely framed in black; and dorso-laterally, above the level of the ear, there is on each side the indication of a light longitudinal stripe, accentuated by an accompanying row of ocelli above, and another below.

Character	N		Percra (Mean, SD, Range)		P
	Males	Females	Males	Females	
ra (mm)	10	7	46.1 ± 4.61 40.0 - 52.0	45.0 ± 2.36 40.5 - 47.0	0.5
Head length	10	7	23.66 ± 1.86 21.59 - 26.96	21.89 ± 1.24 19.77 - 23.33	0.03
Hindlimb length	10	7	61.49 ± 6.36 51.92 - 71.25	56.81 ± 3.81 54.26 - 62.96	0.08
Toe index	10	7	43.34 ± 2.76 36.84 - 47.37	45.98 ± 3.45 43.14 - 53.06	0.12
Precaudal vertebrae	3	8	27.33 ± 0.58 27 - 28	28.13 ± 0.00 28 - 29	0.18

Tab. 6: Sexual dimorphism in *Mesalina guttalata* in the area of sympatry with *M. bahaeldini*. Only characters with significant differences or of comparative interest are shown. Mensural characters are in perca (except ra and toe index). P, significance of the difference betwenen males and females.

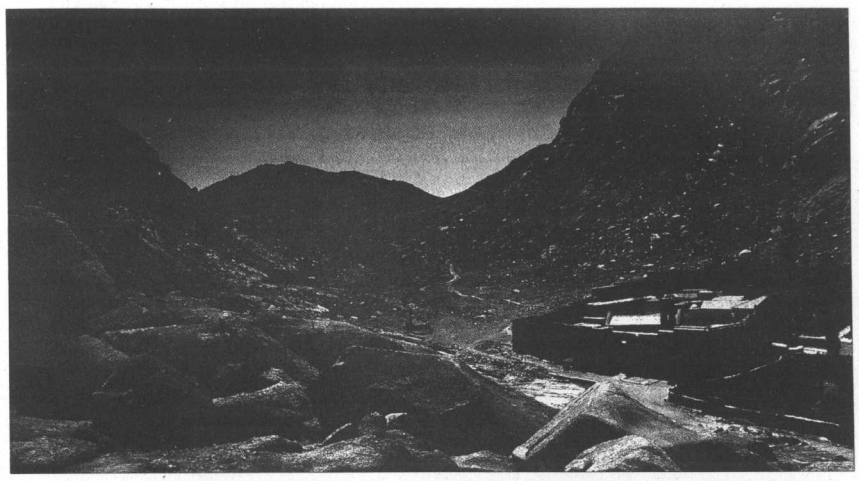

Fig. 4: The type locality of *Mesalina bahaeldini* n. sp., with St. Catherine's monastery, Sinai, Egypt (19.VIII.1979).

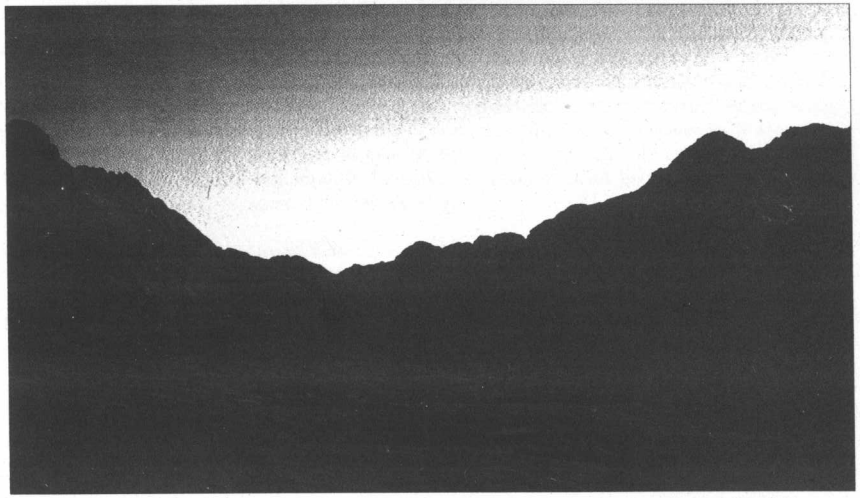

Fig. 5: Typical habitat of *Mesalina bahaeldini* n. sp. around the housing of the Jabaliya tribe (serving the monastery), Ar-Rabba valley, ear St. Catherine's monastery, Sinai, Egypt (7.X.1969).

In contrast, in ZMB 1120 many of the white dots are flanked with black only on one side. In the Nubian specimens, ZMB 1121 and 63144, the colour is dark grey, with only an indistinct indication of ocelli, perhaps due to conservation.

This is a widely ranging species (see below). Data of many specimens or of samples from different areas were presented by ANDERSON (1898), BOULENGER (1921), BONS (1959) and SZCZERBAK (1974) and there exists considerable geographic variation. Some of the quantitative variation in Israel and Sinai is summarised here in Table 1, and in somewhat greater detail, for the south Sinai mountains, in Tables 2-4. For the latter area the extent of sexual dimorphism, including that in the number of precaudal vertebrae, is shown in Table 6. The typical coloration is shown here in Figs. 1 & 2 and also in ROSS (1988: plate 2) and WERNER (1995: p. 50, fig. 4). But the pattern varies from "very faint" in some places (ANDERSON 1898: pl. 23, fig. 3, ARNOLD 1986) to bold ocelli fusing to form transverse bands, in the lava desert of the Jordan-Syria border (WERNER 1971b, MORAVEC & MODRÝ 1994). The specimen from NW Sinai described by ANDRES (1920) as being dark blue without pattern, was probably discoloured by preservation.

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 (LEVITON et al. 1992, SCHLEICH et al. 1996). This definition of the range excludes that of *Mesalina watsonana* of Iran, Afghanistan, Turkmenistan and Pakistan (ARNOLD 1986, LEVITON et al. 1992, ANDERSON 1999).

Ecology and biology: In the area of sympatry with *Mesalina* n. sp. described below, the specimens of *M. guttulata* were collected in the months March (n = 9), April (3), July (5), November (6) and December (1). The ecology and biology of the species were reviewed by SCHLEICH et al. (1996). Some aspects of life history and ecology were reported on from Morocco by BONS (1959), from Algiers by GAUTHIER (1967) and from Israel by ORR et al. (1979), PERRY et al. (1990) and FRANKENBERG & WERNER (1992).

***Mesalina bahaeldini* n. sp.**
(Figures 2, 4-9)

Eremias guttulata (part); WERNER, 1973: p. 20.

Holotype: HUJ-R 10712 ♂ collected on 20.XI. 1968 by DAN BIRNBOIM.

Type locality: Near St. Catherine Monastery, Sinai, Egypt (Israel Grid 049776; 1500 m a. s. l.)

Paratypes (29): From the type locality (8): FMNH 152668* ♂, 20.V. 1958; FMNH 959472 ♀, 14.XI. 1952; HUJ-R 11424 ♀, 7.X.1969; HUJ-R 11425* ♀, 8.X.1969; HUJ-R 12725 ♂, 6.VII.1973; NMP6V 70768/1-3* ♂♂, 1995.

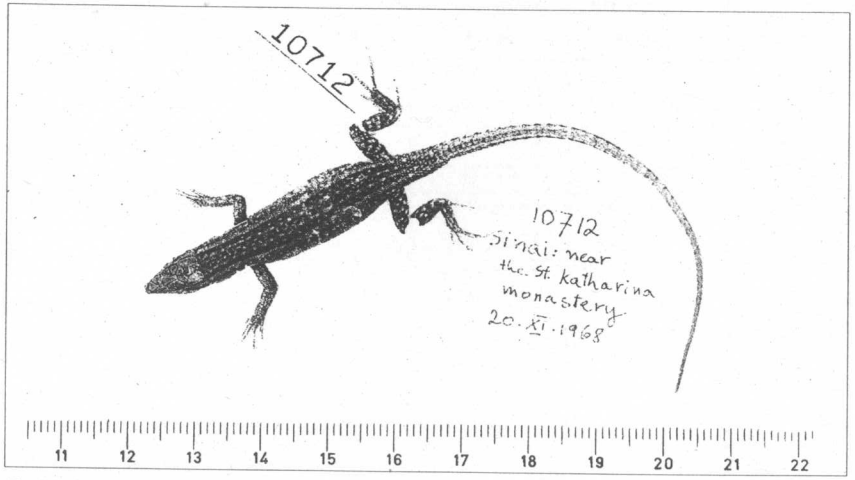

Fig. 6: Holotype of *Mesalina bahaeldini* n. sp., HUJ-R 10712 §.

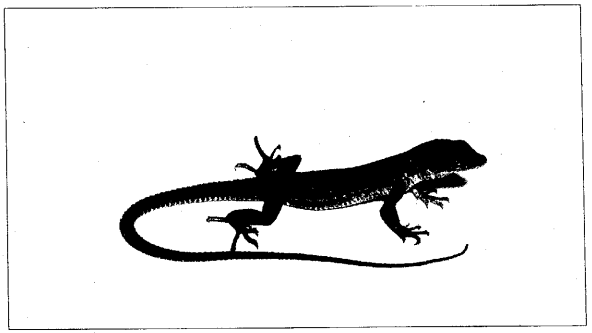

Fig. 7: Lateral view of a male *Mesalina bahaeldini* n. sp. from the locality in Fig. 5.

From elsewhere (21): BM NH 1994.419 ♀ and 1994. 420 ♀, Within 10 mi of Mt. St. Catherine. FM NH 58709* ♂, Wadi Sidri, SW Sinai, 30.XII. 1947 [ca. 990810]; FMNH 95923* ♂ and FMNH 95925* ♀, Wadi El Sheikh, St. Catherine's Monastery area, 13.V. 1953;0 HUJ-R 10701* ♀, W. Nassab (ca. 065769), 21.XI.1968; HUJ-R 10703* ♀, W. Beida & W. Kasab (ca. 075738), 28.XI. 1968; HUJ-R 10711 ♂, Bir a-Nassab (049773), 21.XI. 1968; HUJ-R 10714 ♂, A-Shika (ca. 050784), 24.XI.1968; HUJ-R 10939* ♀, W. el Butum (ca. 09508707), 12.III.1970; HUJ-R 11416 juv., W. Rahaba 1000 m (020803), 25.V.1969; HUJ-R 11417 ♀ and 11427 ♂, Jabalieh Tribe housing (047776), 7.X.1969; HUJ-R 11418* ♀, Farsh Zibir (ca. 022802), 25.V.1969; HUJ-R 11422* ♂, Jabal Iqnah (Ca.026810), 24. V.1969; HUJ-R 13328* ♂, and 13329* ♂, Farsh Abu Rejieh, 1920 m (04527737, W Slopes of Jabal Musa), 30.IV.1976; HUJ-R 13412* ♀, Id Yatmed (06237362), 3.XI.1978; HUJ-R 13603* ♂, Um Hashiba (95409595), I.1977; HUJ-R 13775* ♀, Jabal Sirbal peak (017786), 23.V.1979; MTD 43814 (ex HUJ-R 11421) ♂, Bir Iqnah (025809), 24.V.1969.

Diagnosis: A *Mesalina* with a prominent occipital in contact with the interparietal; curved collar; transparent disc of lower eyelid comprising two major scales, with black vertical bar; upper labials in front of the subocular usually 4, exceptionally 5. Ventral plates in 10 straight longitudinal rows. Scales on the upper surface of the tibia keeled. Lamellae under 4th toe, 20-23. Scales on ventral side of tail smooth. Dorsal coloration of adult brownish, with distinct longitudinal stripes (may be somewhat interrupted).

Description of the holotype: Well-preserved alcohol specimen. Male; somewhat delicate lacertid proportions; head, neck and shoulders about equally wide; tail base swollen for a stretch equalling pileus length, less wide than inter-femoral distance.
Measurements: ra, 43.0 mm; head length, 9.9 mm (23.02 percra); head width, 6.2 mm (14.4 percra); head depth, 4.7 mm (10.9 percra); head index, 159.6; forelimb length, 15.0 mm (34.9 percra); hindlimb length, 24 mm (55.8 percra); fourth toe length, 12.0 mm (27.9 percra); toe index, 50; tail length 77.5 mm (complete ?) (180.2 percra).
Pholidosis (where relevant: L, R): The window in the lower eyelid is divided by a black vertical bar. Supralabials anterior to the suborbital 4, 4; supralabials, total 8, 9; gulars, 22; plates in collar, 11. Dorsals across midbody, 45; ventrals across belly, 10; transverse rows of ventrals, 30, 30; scales on the dorsal side of the tibia distinctly keeled; subdigital lamellae, 21, 22; femoral pores, 11, 12. Ventral tail scales (cranial third of tail) not keeled.
Radiography revealed 28 precaudal vertebrae, and 45 caudal vertebrae. It is not sure whether the tail is complete or a tip is missing.
Coloration (in alcohol): On the overall brownish-greyish body there are alternating light and dark longitudinal stripes. The light stripes are smoothly continuous, two pairs dorsally (the lateral pair beginning at the level of the temporals) and a third pair on the flanks beginning from the ear and passing over the shoulder. The three mid-dorsal dark stripes (or interspaces), each adorned with a series of light dots, merge unto the tail. More laterally, the beige interspace between the two light stripes, the dorso-lateral one beginning at the temporals and the lateral one beginning at the ear, is speckled with light dots. The beige background ventral of the lateral light stripe, down to the venter, is more uniform. Limbs and tail speckled light-and-dark. Ventrally, including throat, limbs and tail – immaculate whitish.

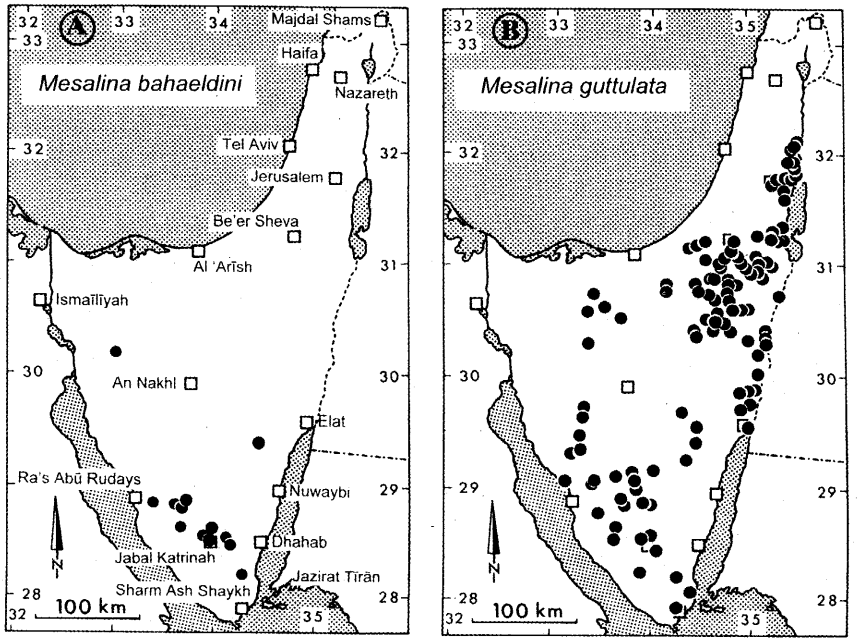

Fig. 8: Maps showing locality records of (A) *Mesalina bahaeldini* n. sp. and (B) *Mesalina guttulata* in the survey area of Sinai and Israel (Werner 1988). Each symbol represents one or more specimens from that location (in HUJ-R).

Character	N		Percra (Mean, SD, Range)		P
	Males	Females	Males	Females	
ra (mm)	12	8	45.2 ± 2.84 43.0 - 52.0	43.2 ± 4.75 37.0 - 50.0	0.3
Head length	12	8	24.36 ± 0.90 23.02 - 26.14	22.26 ± 1.54 19.60 - 24.11	0.01
Hindlimb length	12	8	58.47 ± 3.69 51.92 - 65.12	56.34 ± 4.21 48.89 - 61.90	0.27
Toe index	12	8	46.85 ± 3.69 37.93 - 51.85	47.63 ± 3.89 41.07 - 54.55	0.66
Precaudal vertebrae	4	6	26.75 ± 0.96 26 - 28	28.33 ± 0.52 28 - 29	0.03

Tab. 7: Sexual dimorphism in *Mesalina bahaeldini*. Only characters with significant differences or of comparative interest are shown. Mensural characters are in percra (except ra and toe index). P, significance of the difference between males and females.

Variation: The variation of mensural and meristic (pholidotic) characters is shown in Tables 2-4; the extent of sexual dimorphism in these characters, and in the number of precaudal vertebrae, is shown in Table 7. The coloration of the type series is somewhat variable, the holotype's colour being about average – some are paler and some are more vivid. The dark stripes may have their light speckles accentuated so that the whole stripe looks like a fused chain of ocelli. In some specimens each dark stripe is replaced by a series of very dark dashes, making a bold contrasting pattern. These colour variations appear not to be sexual.

Distribution: The species is endemic to the mountains of southern Sinai, Egypt (Fig. 8).

Ecology and biology: The distribution area largely coincides with the area of the representation of the Irano-Turanian phytogeographical region in southern Sinai (DANIN & PLITMANN 1987; WERNER 1988). Most animals were collected above 1000 m a.s.l. and up to 2070 m (peak of Jabal Sirbal) and apparently none below 600 m. The recorded substrates were bare fine gravel among rocks. and small-bush steppe strewn with largish stones (Fig. 9). The animals were collected in the months January (n = 1), March (1), end-April (2), May (7), July (1), October (3), November (6) and December (1).
Two of the six females radiographed contained unshelled eggs. HUJ-R 10939 from W. el Butum (ca. 09508707), collected on 12.III.1970, contained two eggs measuring approx. 4.6 x 3.6 mm; and HUJ-R 11418 from Bir Iqnah (025809), 25.V.1969, contained five spherical eggs averaging 4.2 mm diameter.

Etymology: Named for SHERIF BAHA EL DIN in recognition of his discriminating and fruitful contribution to the herpetology of Sinai. Thus the epithet should be pronounced bahaeldini. Furthermore, "baha el din" means "glory of the religion" and seems uniquely appropriate for a new creature from Mount Sinai and the surrounding mountains.

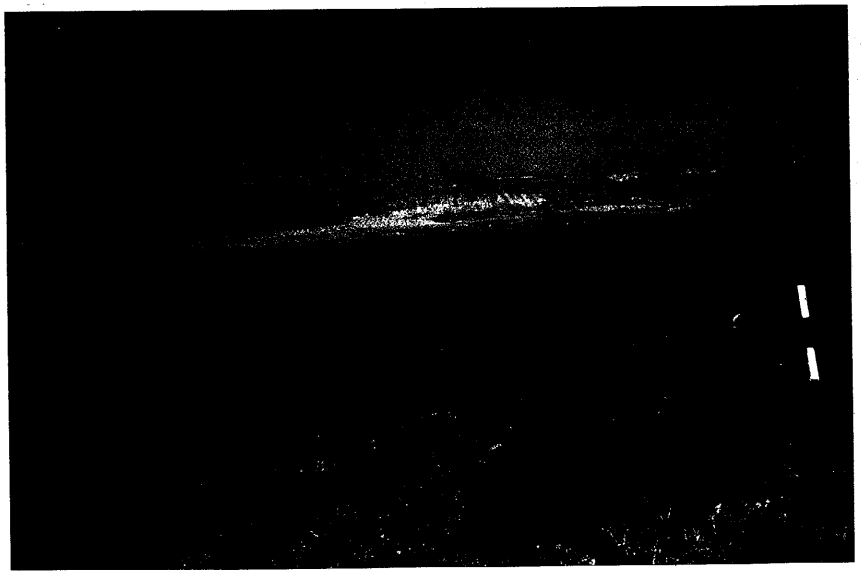

Fig. 9: Relatively lush type of habitat of *Mesalina bahaeldini* n. sp., Jabal Iqnah (24.V.1969).

Key to the species of *Mesalina* of Sinai

1. Ventral plates in 10 longitudinal rows. Scales on the upper surface of the tibia keeled . . . 2
- Ventral plates in 12 longitudinal rows. Scales on the upper surface of the tibia smooth or feebly keeled. 4
2 Scales on ventral side of tail keeled. Transparent disc of lower eyelid comprising several scales, without black vertical bar. Upper labials in front of the subocular usually 5, sometimes 4. Dorsal coloration of adult with distinct longitudinal stripes . . . . *M. olivieri*
- Scales on ventral side of tail smooth. Transparent disc of lower eyelid comprising two major scales, with black vertical bar. Upper labials in front of the subocular usually 4, sometimes 5 . . 3
3 Dorsal coloration of adult, usually generally greyish, without distinct longitudinal stripes, comprises black-and-white ocelli (or white dots accompanied by black specks on one or either side), which may be ordered in longitudinal or transverse rows. . . . . *M. guttulata*
- Dorsal coloration of adult brownish, with distinct longitudinal stripes (may be somewhat interrupted) . . . . . *M. bahaeldini*
4 Rostral not in contact with the frontonasal. Occipital absent, or minute and not in contact with the interparietal. Scales across back, 35-50 . . . . . *M. brevirostris*
- Rostral in contact with the frontonasal. Occipital present, nearly always in contact with the interparietal. Scales across back, 53-67. . . . . *M. rubropunctata*

Discussion

Mesalina bahaeldini n. sp., with striped pattern, used to be mistaken for *M. guttulata,* which normally is more or less ocellated, because the two agree in all the characters used in keys. But once the material from the south Sinai mountains was divided according to the distinctive coloration, the two samples differed significantly also in one of ten mensural characters and, moreover, in four out of eight conventional pholidosis characters. It is because these circumstances occur in a situation of geographical sympatry, that we regarded these two morphotypes as two species.
Biometry failed to guide us as to which of the two agrees with the original *Lacerta guttulata* LICHTENSTEIN, 1823. In almost all measurements and proportions, the syntypes are relatively more similar to *Mesalina bahaeldini* than to *M. guttulata* from the area of sympatry (Tab. 2-3). The same is true for most of the meristic pholidosis characters (Tab. 4). However, LICHTENSTEIN's (1823) verbal description ("guttulis nigris et albis"), and the ocellated pattern of 6/9 of the supposed syntypes (including all five originating from the declared type locality), clarified that it was the striped species that required a new name. The morphological mismatch between the syntypes and our *M. guttulata* sample may well derive from geographical variation in *M. guttulata.* This variation cannot be explored here but it was the likelihood of its occurrence that led us to take the comparative sample from the area of sympatry.
Mesalina bahaeldini is sympatric with *M. guttulata,* of the same body size, and the question arises, whether the two are actually syntopic. BOULENGER (1887, 1921) mentions several specimens of *Eremias guttulata* from Mt. Sinai in the British Museum, and these are normally ocellated (MCCARTHY, personal communication, 7 November 2000). This would indicate syntopy. But in the absence of supporting evidence for such syntopy in our more recent lists of localities (except one), apparently usually the two are not syntopic. Although hypothetically the lack of *M. guttulata* findings from the high-elevation localities could be due to collecting bias in favour of *M. bahaeldini*, we tentatively accept the general lack of syntopy. Similar relations have been reported, for example, between *M. guttulata* and *M. rubropunctata* in Egypt (TORTONESE 1948) and between *M. guttulata* and *M. olivieri* both in Israel (HAAS 1951) and Tunis (BLANC 1980). Comparable conditions have been observed among *Eremias* species (e. g., by OBST 1963, in Mongolia). But this avoidance of syntopy seems to depend on the ecological factors, rather than an inherent tendency for competitive exclusion: ROSS (1988) found in eastern Saudi Arabia that one site was unique in having *Mesalina guttulata, M. brevirostris* and *M. adramitana* occurring syntopically.

The activity season seems to differ between the two species. It is difficult to verify the statistical significance of the temporal distribution of the material, because of insufficient record of the search effort. But it may well be meaningful that the greatest monthly yield occurred for *Mesalina guttulata* in March (n = 9) and for *M. bahaeldini* in end-April (2)+May (7).

Conclusions

1. A population of *Mesalina* (Reptilia: Sauria: Lacertidae) on the mountains of the southern Sinai peninsula constitutes a new species, *M. bahaeldini* SEGOLI, COHEN & WERNER.
2. *Mesalina bahaeldini* resembles *M. guttulata* in conventional key characters but differs from it in consistently being striped (rather than ocellated) and brownish (rather than greyish); having on average fewer supralabials; fewer dorsals in a transverse count at midbody; fewer transverse rows of ventral plates, counted along the venter; fewer subdigital lamellae under the fourth toe; but longer toes, relative to hindlimb length; hence the individual subdigital lamellae are longer, relative to body size.
3. The series of nine syntypes of *Lacerta guttulata* LICHTENSTEIN, 1823, in the Zoologisches Museum, Humboldt-Universität, Berlin, collected by HEMPRICH and EHRENBERG in Egypt and Nubia, is heterogeneous, only six fitting the description of the species. Therefore a lectotype is designated and the species redescribed.
4. The endemic *Mesalina bahaeldini* and the widely ranging *M. guttulata* are geographically sympatric but usually not actually syntopic. The former occurs only above 600 m (usually above 1000 m) a.s.l., the latter – at a wide range of altitudes but its occurrence at the same high altitudes is unclear.

Acknowledgements

We are indebted to R. GÜNTHER, Zoologisches Museum der Humboldt-Universität, Berlin, who enabled this project by lending the syntypes of *Lacerta guttulata* LICHTENSTEIN, 1823, and supplied a copy of the description. For the kind loan of material, or access to material, we are also grateful to C. MCCARTHY, the Natural History Museum, London; A. RESETAR, Field Museum of Natural History, Chicago; N. SIVAN, Hebrew University of Jerusalem, Jerusalem; J. MORAVEC, National Museum (Natural History), Prague. For generous help with radiography we are obliged to U. FRITZ and especially A. ZARSKE, Museum für Tierkunde, Dresden. We thank C. GRACH for help with reading the Russian literature and D. DAROM for preparing our black-and-white illustrations for the press.

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Appendix

Control material of *Mesalina guttulata* from the area of sympatry with *M. bahaeldini*. The listing for each specimen begins with the HUJ-R number, and includes an Israel-Grid topographical map reference in parentheses.

10799 juv., Wadi el Qatsira (085854), 14.III.1970; 10800* ♂, Western Jabal Thih (019836), XII.1969; 10804* ♀, Jabal Thih (019836), 25.XI.1969; 10819* ♀, (035835), 22.XI.1969; 10823 juv., (085854), 20.XI.1969; 10825 ♂, W. Kaki (03758340), 20.XI.1969; 10826* juv., (03608250), 20.XI.1969; 10937 ♂, W. Shaira (096886), 12.III.1970; 10940* ♀, W. El-Butum (ca. 09508707), 12.III.1970; 10941 ♂, (093885), III.1970; 11426 juv., Jabal Abu-Zariv (981867), 25.III.1969; 11431* ♀, W. Dalema (982867), 26.III.1969; 11435* ♂, Jabal Abu-Zahuv (981867), 25.III.1969; 11436* ♂, W. Dalema (982867), 26.IV.1969; 11437 ♂, Bir el-Butum (ca.839782), 14.IV.1969; 11439* ♀, W. Delema (982876) 26.III.1969; 12418* ♀, Jabal Mahara (043814), 21.VII.1968; 12427* ♂, Jabal Abas-Basa (042775), 12.VII.1968; 12430* ♀, Jabal Dalal (043814), 21.VII.1968; 13424 juv., W. Muheizin (06377505), 4.XI.1978; 13745* ♂, W. Sigalia, 8.IV.1979; 13839* ♂, W. El-Leiga (04707744), 18.VII.1979.