Mesalina brevirostris Blanford, 1874 (Reptilia: Lacertidae) in Lebanon, with data on reproduction

by Herman A. J. in den Bosch

Abstract. The Short-nosed Desert Racer, *Mesalina brevirostris*, is reported for the hamada north and northeast of Hermel, north-eastern Lebanon; the first confirmed record for this country. Older records, which may refer to *Mesalina*, are analysed. Data on size, pholidosis, and colour are presented and discussed. The courtship ritual is described for the first time: after an introduction of 130 seconds the male bites the female's groin. During the 75 seconds of copulation, the male employs two series of tail-base motions. This repetition is unique among the lacertids. Also unique among the lacertids is the location of the bite-hold that the male maintains on the female. He grabs a piece of dorsolateral skin just above the base of her tail and can hold on for up to one hour. Five clutches per year, with 1-6 eggs (average 3.9), were produced. Fertilised eggs measured 7.0x11.7 mm and weighed 0.35 g. After 59 days at 25°C and 38 days at 29°C, juveniles of 23+38 mm and 0.35 g hatched. The young reach sexual maturity within one year. Increased agricultural use of the Lebanese habitat of *M. brevirostris*, the hamada, could endanger the future survival of the species in this country.

Kurzfassung. Der Kurzkopf-Wüstenrenner *Mesalina brevirostris* wird aus der Hamada nördlich und nordöstlich von Hermel, im Nordosten Libanons, gemeldet; es handelt sich um den ersten bestätigten Nachweis für dieses Land. Alte Angaben, die sich möglicherweise auf *Mesalina* beziehen, werden analysiert. Daten über Maße, Pholidosis und Färbung werden präsentiert und diskutiert. Das Paarungsverhalten wird zum ersten Mal beschrieben: nach einem Vorspiel von 130 Sek. verbeißt sich das Männchen in die Leiste des Weibchens. Während der Kopulation, die durchschnittlich 75 Sek. dauert, zeigen sich zwei Folgen von Schwanzbasisbewegungen, die einzigartig innerhalb der Lacertiden sind. Auch nach Beendigung der Paarung verbeißt sich das Männchen noch in das Weibchen, dann allerdings in einer Hautfalte oberhalb ihrer Schwanzbasis, was auch einmalig innerhalb der Familie ist. Die Post-Kopulationsphase kann bis zu einer Stunde dauern. Es werden 5 Gelege pro Jahr, mit 1–6 Eiern (durchschnittlich 3,9), produziert. Befruchtete Eier messen 7,0x11,7 mm und wiegen 0,35 g. Die Jungen schlüpfen nach 59 Tagen bei 25°C bzw. 38 Tagen bei 29°C, sind 23+38 mm groß und 0,35 g schwer. Innerhalb eines Jahres wird *M. brevirostris* geschlechtsreif. Zunehmende Agrarisierung der in Libanon seltene Hamada, dem Habitat von *M. brevirostris*, könnte das Überleben dieser Art in diesem Land gefährden.

Key words. Herpetofauna, courtship, behaviour, identification, Middle East.

Introduction

Older records of the eremic genus *Mesalina* in the Lebanon have not been reconfirmed for over a century and recent sightings seem to be misidentifications, especially when reported from Mediterranean habitats, as *Mesalina* prefers desert habitats. Lebanon has a predominantly Palearctic and relatively mesic herpetofauna (IN DEN BOSCH 1998). The only area approximating a desert is the hamada around Hermel in the northeast, in fact a continuation of the Western Syrian Desert. During fieldwork in this region in May/June 1999 I collected

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lizards which at first sight resembled *Acanthodactylus*, not unexpected since *Acanthodactylus tristrami* (Günther, 1864) is known from this region (Lebanon including east of Ba'albek and Syria; WERNER 1935, SALVADOR 1982), and the area fits its habitat requirements. However, the animals were smaller and had a somewhat different colouration. Closer examination, and later observations on courtship behaviour, which differed from *Acanthodactylus*, pointed to *Mesalina*. Results on taxonomy, reproduction, and behaviour are presented here. Details on husbandry have been published in a previous paper (IN DEN BOSCH & BOUT 1998).

Records of *Mesalina* in Lebanon

Mesalina Gray was resurrected in the SZCZERBAK (1974) review on *Eremias* for the characteristic group of small lacertid species found in North Africa and the Saharo-Sindian region of Southwest Asia. ARNOLD (1986b) confirmed the holophyly of *Mesalina* based on hemipenial evidence. For Lebanon two epitheta specifica occur in literature (*brevirostris* and *guttulata*) to which can be added that *Mesalina olivieri* has elsewhere often been confused with the latter.

The first *Mesalina* reported for Lebanon ('Beyrouth') was *Mesalina guttulata* (Lichtenstein, 1823) by LORTET (1883) as *Eremias guttulata* D. et B., and TRISTRAM (1884) who cited the former author's locality as 'near Beyrout'. Already HAAS (1951) considered the locality 'near Beirut' of TRISTRAM (1884) as quite misleading and at the same time expressed wonder why Tristram – who so often visited the Dead Sea region and the Lower Jordan area – did not report *Mesalina guttulata* from there, where it is a common species, and so HAAS assumed there was a locality mix-up. The range of *Mesalina guttulata* is Iraq, Jordan, northern and western Saudi Arabia, Yemen, Israel, and North Africa, throughout Iran and Afghanistan below 2,500 m, north to southern Turkmenistan (LEVITON et al. 1992). MORAVEC & MODRÝ (1994) published the first properly documented record for Syria: near Ar'Rakiyeh. As yet, based on the species' ecology and distribution, it seems improbable for *Mesalina guttulata* to occur in Lebanon. *Mesalina olivieri* (Audouin, 1829) is sympatric with *M. guttulata* over much of its western range, and both species were not separated by many earlier authors (SCHLEICH et al. 1996) though the former has a more striped pattern and a different palpebral disc. Hybrids are said to occur very rarely in Israel (Ibid.), but also *M. olivieri* does not seem to reach Lebanon.

Both PERACCA (1894) and WERNER (1935) reported *Mesalina brevirostris* Blanford, 1874 (as *Eremias brevirostris*) for Lebanon though without exact locality data: Valle Coelesyria, and steppe east of Ba'albek respectively. Previously I judged Peracca's locality in the humid Beka'a to be in error, considering the distribution and ecology of the species, and that no animals had come to light for over a century. Geographically the area around Hermel is an extension of the classical Coelesyria, and so perhaps Peracca was merely imprecise. WERNER's (1935) steppe east of Ba'albek remains puzzling as there is not much steppe since the Anti-Lebanon rises almost immediately east of Ba'albek, though in theory animals from there could be in contact at the lower altitudes through an area roughly following a northeasterly line via Younine, El Aïn to Hermel.

A commonly used field character to distinguish *Mesalina* from *Acanthodactylus* is the nostril being well separated from the first labial scale in *Mesalina*; it is in contact or very close to it in *Acanthodactylus* (e.g. ARNOLD 1986a). In the lizards from Hermel the nostril is between three nasals, which clearly matches *Mesalina*. As well, since the occipital is minute

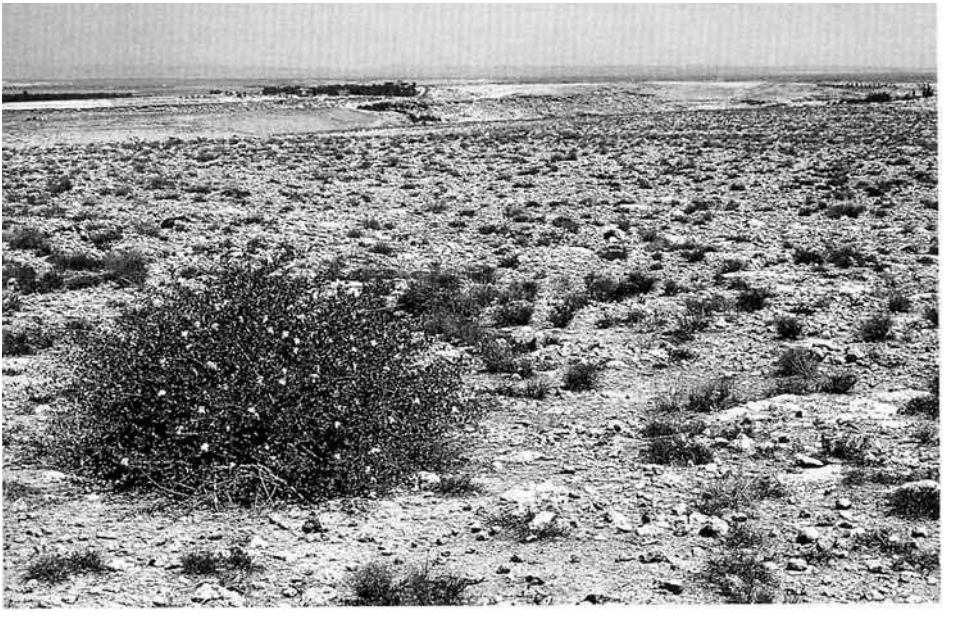

Fig. 1. Habitat of *Mesalina brevirostris* near Hermel, northeastern Lebanon (Photo: H. A. J. IN DEN BOSCH).

or absent and when present is not in contact with the interparietal, the scales on the upper surface of the lower leg are smooth, the large transparent scales of the lower eyelid are not edged with black (as in *Mesalina guttulata*), nor is the lower eyelid without a distinct window but shows a semitransparent area of 8–10 scales, the species allocation for these Lebanese specimens is *Mesalina brevirostris*. The range of this species is Sinai, northern Saudi Arabia, Syria, Jordan, Iraq, Kuwait, southwestern Iran and islands of the Arabian Gulf, Pakistan, Bahrain, Qatar, and United Arab Emirates (LEVITON et al. 1992).

No records of *M. brevirostris* in the immediately neighbouring part of Syria seem to have been published (MORAVEC 2001 and pers. comm.). BISCHOFF & SCHMIDTLER (1994) report two localities further east (80 km NE Damascus, and 59 km SW Palmyra). If, however, BOULENGER's (1921) Jerud is the present-day Yarud (approx. 50 km NNE Damascus), this is the locality nearest to Hermel outside Lebanon. It is remarkable to find *M. brevirostris* on both sides of the north-easterly flowing Orontes (Nahr el Assi) as this either indicates that the river forms no natural boundary to the species, or that the spread westwards into Ard el Kroum occurred south of the Orontes source at Deir Mar Maroun, thus N.E. of Ba'albek.

Lebanese *Mesalina brevirostris* live in the hamada north and northeast of Hermel (Ard el Kroum and Ard el Qamar, alt. approx. 700–750 m). Hamada is a desert type plain strewn with variously sized stones where vegetation is sparse but maintained by rainfall. *Artemisia* and *Phlomis* species and many annual grasses are commonly encountered, in Lebanon *Capparis* and small thorny Compositae are also familiar elements (Fig. 1). In the same area *Ophisops elegans* was found, but these lacertids seem to be restricted to the irrigated watermelon fields and are only rarely encountered in the real hamada.

Tab. 1. Size and colouration of adult Lebanese *M. brevirostris*. The wild-caught and the specimens which hatched in 1999 were measured outside breeding season on 25.10.2000, the specimens which hatched in 2000 on 2.7.2001. "hatched" means "hatched in captivity"; r = regenerated.

no.	sex	origin	snout-vent + tail (mm)	weight (g)	colour throat	colour belly
1	♂	wild-caught 1999	56+115	5.52	white	white
2	♀	wild-caught 1999	58+70(r)	4.49	white, speckled with brown	white, speckled with brown
3	♂	hatched 1999	46+99	3.59	white	white
4	♀	hatched 1999	41+79	2.17	white	white
5	♀	hatched 2000	44+98	3.22	white	white
6	♂	hatched 2000	46+101	3.43	white	white
7	♂	hatched 2000	44+88	2.68	white	white

The desert habitat of *M. brevirostris* brings to mind another old lacertid report. It is still unclear what are the *Zootoca deserti* Gthr. or *Lacerta deserti* Günth. 1859 listed in GÜNTHER (1864), BÖTTGER (1880), VON BEDRIAGA (1880), and TRISTRAM (1884) for Lebanon, the plains beneath Hermon and Lebanon, and Palestine. BOULENGER (1921: 63) entered them (and *Lacerta deserti* of MILNE-EDWARDS; Ibid.: 66) into the synonymy of *Acanthodactylus pardalis*, but this seems incorrect because I agree with HAAS (1951) who thought that the above mentioned localities are improbable since when encountered *A. pardalis* shows dense populations, and it has not been found again in Lebanon. Besides, *A. pardalis* has a much more southerly distribution, from Israel via north Egypt to Cyrenaica in eastern Libya (ARNOLD 1983). Nevertheless, SALVADOR (1982: 80) lists *Lacerta deserti* Milne-Edwards, 1829 from the 'Levant' (syntypes MNHNP 5322(2)) (locality 'Perse et de l'Asie Mineure' interpreted by BOULENGER (1921: 69, 73) as 'probably Syria' and 'Levant' respectively), under *Acanthodactylus pardalis* (Lichtenstein). MARTENS (1997) reasons why a listing of *A. pardalis* for Syria (DISI & BÖHME 1996) obviously refers to a few misidentified animals, making occurrence in Lebanon all the more improbable. MORAVEC et al. (1999) regard the name *Lacerta deserti* Milne-Edwards 1829 as a nomen dubium.

One could wonder if ZINNER's (1967) "similar to *Acanthodactylus pardalis*" north of Ba'albek were in fact at least in part identical to the animals I found near Hermel, and thus were *Mesalina brevirostris*. Their behaviour, taking flight early and hiding in shallow holes in the hard ground and not in the vegetation, and being active all day long even in hot temperatures points to this, as does the colouration and the total length (some 14 cm), perhaps the stocky body (a concept not typically associated with *Mesalina*) as further mentioned by ZINNER (1967) against it.

Size, pholidosis and colour

One couple was collected in 1999. The male measured 50+109 mm (snout-vent+tail) and weighed 4.25 g; the gravid female 56+61 mm (tail regenerated) and 4.51 g. They had in-

creased to 56+115 mm, 5.52 g and 58+70 mm, 4.49 g when measured a year later (25.10.2000) outside the breeding season (Tab. 1). In males tail bases are markedly swollen. Because Lebanese specimens have not been reported previously, the seven lizards discussed herein are treated separately (2 wild-caught adults, 3 specimens hatched in captivity in 1999, and 3 in 2000) (Tab. 1).

With maxima of 58 mm snout-vent and 115 mm tail-length, the Lebanese *M. brevirostris* seem comparatively large as ROSS (1988) gave a maximum of 50 mm snout-vent, and ARNOLD (1984) stated 55 mm, though ANDERSON (1999) listed "unusually" large ones of 64 mm from Jordan. In Syria the largest specimens reach 57 mm snout-vent (MORAVEC 2001). The approximately one year old captive-bred specimens (Tab. 1) are noticeably smaller than the wild-caught ones, which may represent a terrarium artefact or indicate that at this age they are not yet fully grown.

Tab. 2. Scale counts in Lebanese *Mesalina brevirostris*. Numbering as in Tab. 1. dors. = dorsals; ventr. = ventrals; marg. = marginal; r = right; l = left.

no	dors.: around mid-body	ventr.: longitudinal series	ventr.: transverse series	pre-anals	collar plates	gu-lars	subocular (r/l)	femoral pores (r/l)	lamellae 4th toe (r/l)	occipital
1	53	10 + marg. row of half-sized plates	32	5	8	23	enters mouth (r); a tiny scale found fronto-ventrally on the left	17/17	20/20	very small
2	51	12	33	4	9	24	enters mouth; a tiny scale found fronto-ventrally	16/16	19/19	absent
3	46	10 + marg. row of half-sized plates	32	5	9	22	does not enter mouth	18/19	20/18	very small
4	46	10 + marg. row of half-sized plates	30	5	9	22	enters mouth; scale (2/3 width subocular) found frontoventrally	15/15	19/17	absent
5	52	10 + marg. row of half-sized plates	31	5	9	23	does not enter mouth	17/17	20/20	absent
6	52	10 + marg. row of half-sized plates	32	5	8	26	r: does not enter mouth; l: enters mouth; a tiny scale found fronto-ventrally	18/18	20/21	absent
7	48	12	30	5	9	25	does not enter mouth	18/17	19/21	absent

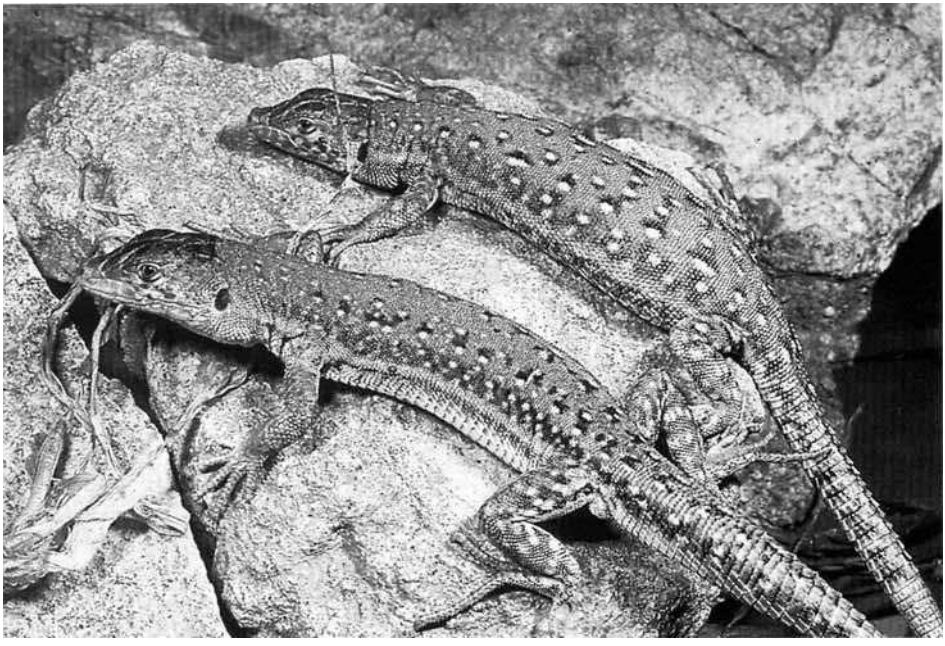

Fig. 2. Pair of Lebanese *Mesalina brevirostris* (female above, male below). (Photo: H. A. J. IN DEN BOSCH).

Tab. 2 lists several pholidosis characters, especially those considered by HAAS & WERNER (1969) in describing forms of *M. brevirostris*. The nostril is situated on a protuberance, consisting of three nasals, the lower in contact with the rostral and first supralabial. The occipital is absent or minute and never in contact with the interparietal. The subocular may or may not border the mouth and a smaller scale may adjoin the subocular fronto-ventrally. The collar is curved and free, with 8–9 collar plates (sometimes with an additional 1–4 very small scales at the extreme lateral ends). There are 15–19 femoral pores, 17–20 lamellae under the fourth toe, 46–53 dorsalia across the middle of the back, and 10 ventral plates plus two marginal rows of half-sized plates in 30-33 transverse series.

With 46–53 dorsalia across the midbody, Lebanese *M. brevirostris* show decidedly higher counts than those listed in HAAS & WERNER (1969) for Syria-Pakistan as 31–50, with the average per locality never above 46 and usually well below that. However, MORAVEC (2001) arrived at a larger range and higher count of dorsalia for Syria, viz. 39–64. HAAS & WERNER (1969) place special value on dorsal counts, and described *M. b. fieldi* from localities in southwestern Iran mainly based on larger dorsals. ANGEL (1936) described a small-scaled subspecies *Eremias brevirostris microlepis* from Haouarine (55 km SE Homs) in Syria based on a single specimen with 60 dorsals and 26 lamellae under the fourth toe, and a higher number of femoral pores (18–20). Though HAAS (1957) considered this description to be invalid, WERNER (1971: 237) recognised this form for western Syria and northern Jordan. With on average 49 dorsals, 17–20 lamellae and 15–19 femoral pores, the Lebanese lizards do not resemble this subspecies.

HAAS & WERNER (1969) regarded specimens from eastern Syria, Iraq, Jordan and Pakistan as *M. b. brevirostris*, and further felt that Arabian material could represent a distinct subspecies. ANDERSON (1999) mentioned specimens from Rutba, Iraq, with high dorsal counts (45–50), others from Iraq and Saudi Arabia with 37–46, and animals from Zarqa, north of Amman (Jordan) with 54–60 dorsalia. HAAS & WERNER (1969) listed the arrangement of the subocular relative to the mouth for a limited sample from Syria, Iraq, and Saudi Arabia. They may have suspected a geographical tendency, but this remained unclear. In Lebanese animals all possibilities from fully entering the mouth, a scale of varying size wedged in between the subocular and the mouth, a fully developed supralabial being present ventral to the subocular, and a left-right asymmetry in a single animal, are present. This suggests a low taxonomical value for this character. In five out of seven animals the marginal rows of the 12 longitudinal series (thus 10+2) of ventrals consists of half-sized plates (Tab. 2). This condition of marginal rows of half-sized plates has been reported in *M. olivieri* (ROSS 1988, SCHLEICH et al. 1996), but to my knowledge not explicitly in *M. brevirostris*, even though e.g. BOULENGER (1921) and ANDERSON (1999) give "ventral plates in 12 (rarely 10) rows" which may cover this character state. All other characters seem to fall well within the diagnosis of the species. In summary, I find it difficult to judge pholidosis variation as described for few specimens of a species apparently distributed over such a huge area and so I refrain from a subspecific notation. Also for Syria MORAVEC (2001) has not yet arrived at an obvious distributional picture of pholidosis variation, though he examined 73 museum specimens, but he and I agree (MORAVEC, pers. comm.) that the Lebanese animals more or less fit his intermediate form.

The general dorsal colouration of Lebanese *M. brevirostris* is pinkish light-brown (Fig. 2). This corresponds noticeably with their habitat. From a distance, rows of cream coloured, dark brown or almost black spots, or a combination of these, create an impression of longitudinal striping. Normally a pair of dorsolateral rows is found on each side. Sometimes two more dorsally situated chains of dots are added and/or a darker lateral band occurs on the body (continuing for a short distance on the tail) with smaller light and dark specks added to it. Though not exactly ocelles, especially the larger cream coloured spots are often bordered at least dorsally by a dark brown to black crescent and/or a vague brown halo, the latter is usually more pronounced ventrally. The creamy spots are also found on the hind legs and proximal tail. Ventrally the animals are white, or white with tiny speckles of brown creating to some extent a greyish effect.

It is as yet uncertain what function the blue of the tail and hind legs (see reproduction) in the juveniles has. A purpose in inter- or intra-specific communication as proposed for other lacertids (cf. IN DEN BOSCH & ARNOLD 1996) is feasible.

Behaviour

When pursued *M. brevirostris* run quickly from bush to bush at the feet of which they can disappear or flatten themselves to the ground. Sympatric *O. elegans* tend to hide between the twigs of the bushes. *M. brevirostris* also take cover in the sometimes-present cracks or in old spider holes in the brownish-pink earth. ROSS (1988) noted that *M. brevirostris* near the coast in eastern Saudi Arabia were seen running from plant to plant, taking refuge under flotsam, and occasionally hiding in Cola cans, while those seen living inland tended to climb under vegetation during the heat of the day but in cool weather climb onto stones or hide

beneath them. ROSS (1988) further stated that cold specimens may be brown or fawn, whilst warm ones may be greyish blue, something I cannot confirm in Lebanese animals.

In May/June 1999 the Lebanese *M. brevirostris* were already active in the early morning (6:30 a.m.). At this time the lizards may bask with their front legs stretched out distally on their backs. Remarkably, several specimens were also active around the hot noon period. WEBER (1960) cites Iraqi *M. brevirostris* being active on the surface in mid-morning (9:00) and at noon at surface temperatures of 38°C and 46°C respectively. Under captive circumstances *M. brevirostris* show a high heat tolerance as well and remain under spotlights even on hot summer days, frequently with an open mouth. The tail end is in this situation at times curved upward. Just like *Ophisops elegans* (unpubl. observations) they thus appear to be able to regulate their temperature by evaporation from the mucous membrane of the mouth.

Courtship behaviour

Five courtship sequences involving two couples were observed (Tab. 3), four of which were recorded on video. Analysis resulted in the following generalised description.

Courtship starts when the male quite abruptly bites the female's neck or flank. During the introduction of 130 secs (n = 4; one session had already started) the pair will usually perform 2–7 very fast circling movements with longer pauses in-between. Some walking, usually initiated by the female, is also seen. Next, the male rapidly shifts his grip to immediately in front of a hind leg or her groin, sometimes biting in a dorsolateral piece of skin just anterior to the female's tail base. Simultaneously or slightly later the male's tail will contract repeatedly (2-5x) approximately in the middle, bending it to some extent laterally and occasionally also vertically. Next the male curves his hindbody, his tail swings forward alongside the female, she raises her cloaca, and intromission is achieved.

One of the male's front legs now commonly rests on her back, the other one is tucked in between his curved body, the ipsilateral hind leg across her tail base, and the contralateral one is on the substrate. The cloacae are raised a little from the substrate. Instantly the first series of very clear pumping-pushing tail-base motions of the male begin (on average 36.8x/24.8 sec.; 1.5x/sec., somewhat slower halfway). The amplitude is 1–2 mm. The cloacae lower gradually. This series is followed by a pause (29.2 sec., n = 4) during which only rapid and shallow breathing of the partners is evident (15-20x/10 sec.). The male's tail may relax a little. Rarely the female takes a few steps. In one case there was only a very short pause (<2 sec.). The second series of male tail-base motions is always initiated by a minor shock going through the pair, and the cloacae again being raised somewhat. The 2-3 mm amplitude of the tail movements (26.2x/22.6 sec., 1.2x/sec.) is unmistakably larger than before, and the movements now show a more vertical component compared to the first series which was mainly laterally oriented. Sometimes at this point clear contractions in the male's tail base can be discerned. Just a few seconds after the last tail-base motion, the male stretches his tail backward, pulls his cloaca away and the female commonly does a few steps. Copulation lasts on average 74.8 sec.

The male maintains his hold on the female with his snout tip gripping a piece of dorsolateral skin above the female's tail base (Fig. 3). This post-copulatory phase can take just a few seconds (Tab. 3), after which the female struggles free, but in the more typical situation lasts from 16 min. to almost one hour. This duration appears to be corroborated by the fact that when a male is shaken off, he follows the female persistently for at least 10–15 min.

Tab. 3. Duration of courtship elements (seconds) in Lebanese *Mesalina brevirostris.* *averages of incomplete or aberrant series seem inappropriate; see text. W = wild-caught, '99 = born in 1999.

date (2000)	male x female	intro-duction	1st series male tail movements (N/secs)	pause	2nd series male tail movements (N/secs)	copula-tion	post-copula-tory bite
21-vi	'99 x '99	109	37/26	20	22/16	67	9
22-vi	'99 x W'99	>19	31/33	<2	25/27	62	2357
23-vi	'99 x '99	290	37/19	28	26/20	70	52
26-vi	W'99 x W'99	36	37/24	15	31/25	73	3576
04-vii	'99 x '99	86	42/22	54	27/25	102	960
range		19-190	31-42/ 19-33	2-54	22-31/ 16-27	62-103	9-3576
average*		—	1.5/1	29.2 [n=4]	1.2/1	74.8±15.7	—

trying to regain contact. Failing that, he tries to stay close to the female, raised on his front legs and scanning the surroundings, a position very reminiscent of post-copulatory behaviour in *Lacerta parva* (IN DEN BOSCH 1990). In the post-copulatory bite phase the position of the male changes from an initial perpendicular stance respective to the female's axis, to one in which he lies on top of her or parallel to her on one side. Near the end a perpendicular position is usually seen once more. There is little displacement of the pair. About 15–20 sec. into the post-copulatory bite the first of a series of sudden, lateral jerks of the female's hind body occurs. The frequency of these jolts change from 6-8x in the beginning, to a maximum of 17-20x after about ten minutes then decreasing again to 6-8x after approximately 20 min. Increasingly her whole body, from snout to tail, seems involved in these brief (<1 sec.) jolts with an amplitude of 2–3 mm, though sometimes much larger, displacing the pair over 2–3 centimetres. Remarkably, these movements progressively change into lateral movements of the female's head, and near the end generally disappear altogether. The male also performs some short, pulling motions by jerking at the piece of skin grasped in his jaws, but in most instances his rhythm of tugs is not synchronous with the female's twitches. Near the end of the post-copulatory phase the female increasingly raises her head, also by stretching her front legs. In the five courtships observed it was always the female that ended the session by suddenly wriggling herself free. Afterward the animals may bask together.

Two series of tail-base movements during copulation in *M. brevirostris* are unique within the lacertids (having seen over 70 species in the genera *Acanthodactylus*, *Adolfus*, *Algyroides*, *Gallotia*, *Holaspis*, *Lacerta* s. lat., *Latastia*, *Podarcis*, *Psammodromus*, and *Takydromus*). In contrast, the circling in the introduction is also known in the probably closely related *Acanthodactylus* (e.g. IN DEN BOSCH & ARNOLD 1996).

In chance observations on courtship in *Mesalina reticulates* I noticed that the male gripped a piece of skin in the neck of the female. A full flank bite just in front of a hindleg occurs in *Mesalina rubropunctata* (from the Western Desert in Egypt) that I videotaped (introduction of 2'33", copulation 1'38", and post-copulatory phase 35'44"). Unfortunately the initial distance from the camera was too far for detailed observations on the copulation. However, it was apparent that the post-copulatory phase included sideways movements of the male's head while he continued his flankgrip, somewhat alike to such tugs by male *M. brevirostris*.

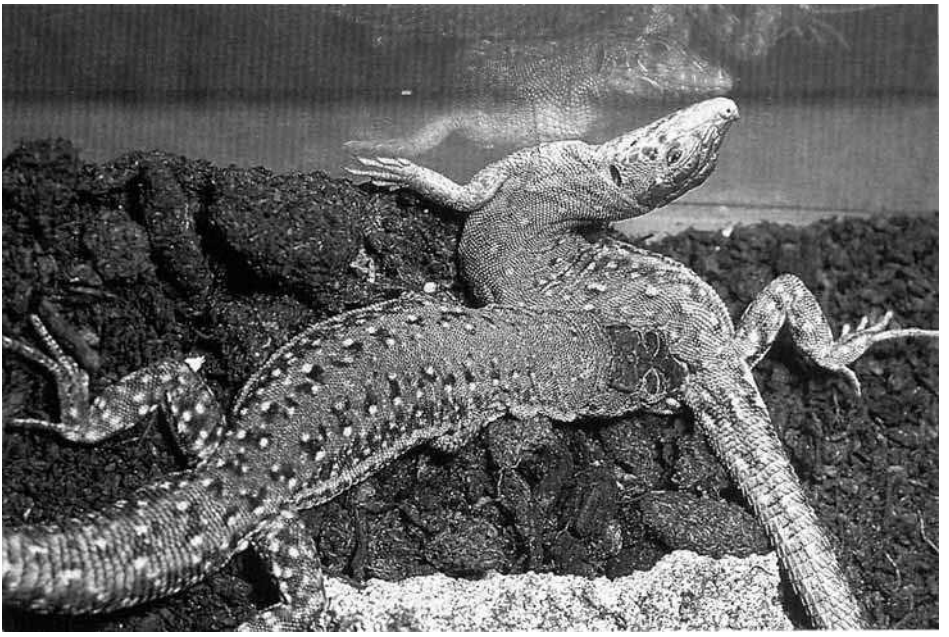

Fig. 3. Lebanese *Mesalina brevirostris* in post-copulatory bite. (Photo: H. A. J. IN DEN BOSCH).

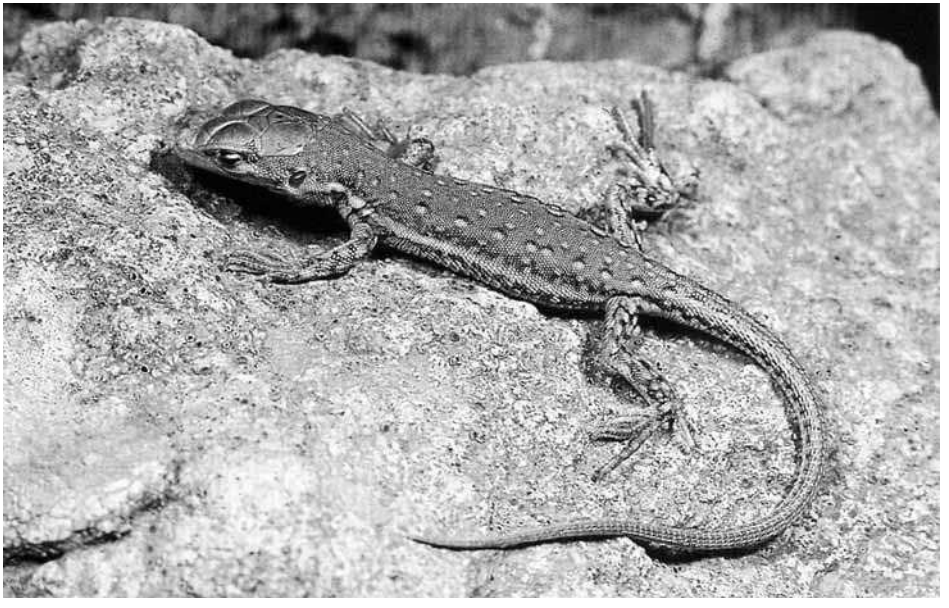

Fig. 4. Two-day old juvenile of Lebanese *Mesalina brevirostris* (Photo: H. A. J. IN DEN BOSCH).

These headshakes lasted about 1 sec. in which the head moved left-right 2-4x, in a frequency of maximally 23x/min., later decreasing to 10x/min. Also in this species the female wriggled herself free in the end. SCHLEICH et al. (1996) cite GAUTHIER (1966) who likewise described a flankhold on the female for *M. rubropunctata*, copulation beginning with a tail twist, and that the grip is held for hours, the male even dragging the female around. Presumably the latter refers to a post-copulatory phase. For *Mesalina guttulata* SCHLEICH et al. (1996) reported a flank bite during copulation. In April 2001 I observed *M. guttulata* females in the St. Katherine Protectorate (Egypt, Sinai) with very obvious bite-marks both in front of the hindlegs and behind the frontlegs (especially pronounced dorsally), suggesting that in this species the introductory bite and/or the post-copulatory bite probably centers behind the pectoral region. This corroborates GAUTHIER's (1966) observation that copulation involved a flank bite in this species. DOUMERGUE (1901) reported a bite in the groin for *Mesalina olivieri* with copulation lasting longer than 15 minutes (though I suspect this time also included post-copulatory behaviour).

In summary, it appears that very little is as yet known about the reproductive behaviour of *Mesalina*, and it could well be that tail-base movements occurring in two bouts in *M. brevirostris* are just characteristic for the species and not the genus. Similarly, the location of the bite hold seems to vary within the genus. What does seem clear is that all *Mesalina* show a post-copulatory bite of considerable duration.

Reproduction

In 1999 the wild-caught female produced five clutches with a total of 13 eggs between mid-June and mid-August; in 2000 she also had five clutches, with a total of 27 eggs between March and mid-July (Tab. 4). The young female born in 1999 produced at least one clutch in 2000 (apparent through sudden sunken flanks), but the eggs – nor possible later clutches by her – could not be retrieved.

Twice it was seen that the female began excavating the nesthole, in a plastic box containing moist potting soil, very early in the morning around 6:00 and finished laying her eggs around 10:30. In the afternoon a fairly large amount of dry peat (used on the floor of the terrarium) was shovelled against the container from which the eggs had been removed. She continued adding more peat early next morning, suggesting at least a brief period of parental care. Oviposition in early morning could be related to temperature; this avoids the afternoon heat in the field.

The third and fourth clutches of the wild-caught female in 1999, as well as her first four in 2000, consisted of soft, relatively small and light eggs, usually an indication of being unfertilised. Exchanging the wild-caught male for the male born in 1999 after the fourth batch, resulted in her fifth clutch yielding offspring.

A clutch consists of 1–6 eggs (avg. 3.9), with a freshly-laid fertilised egg measuring 7.0x11.7 mm and weighing 0.35 g. These eggs are white, often with finer soil particles adhering to them, possibly because of the slightly rough surface texture. Unfertilised eggs weigh on average only approx. 0.20 g. Just before hatching eggs have grown to 11.2x19.9 mm and 1.46 g. Juveniles measure (snout-vent+tail) 23+38 mm and weigh 0.35 g, but show a fairly large range of dimensions. Incubation takes 59–60 days at 25°C, and 36–39 days at 29°C.

Tab. 4. Measurements of eggs from produced in 1999/2000 by a single female *Mesalina brevirostris*, caught in the Lebanon in 1999. Records combined for both years, except eggs/clutch. * = For two of the eggs the date of oviposition could not be determined accurately.

	n	average±SD	range
eggs/clutch			
• 1999: 3, 2, 1, 4, 3	5	2.6±1.1	1-4
• 2000: 6, 6, 6, 4, 4	5	5.2±1.1	4-6
freshly-laid fertilised eggs*			
• width (mm)	7	7.0±0.4	6.6-7.5
• length (mm)	7	11.7±0.9	10.6-13.1
• weight (g)	7	0.35±0.05	0.29-0.40
fertilised eggs about to hatch			
• width (mm)	9	11.2±0.8	10.3-12.7
• length (mm)	9	19.9±1.8	17.1-22.7
• weight (g)	9	1.46±0.35	1.12-2.08
incubation period (days)*			
• 25°C	3	59.3±0.6	59-60
• 29°C	4	38.3±1.5	36-39
juveniles			
• snout-vent (mm)	9	23.0±2.4	20-27
• tail (mm)	9	38.4±5.6	31-48
• weight (g)	9	0.35±0.10	0.22-0.51

Tab. 5. Reproductive data on four *Mesalina* species as summarised from various sources in SCHLEICH et al. (1996).

species	clutches/ year	eggs/ clutch	size eggs	incubation	size juveniles
M. guttulata	several	4.4 (2-7)		4 mo. 25°C 2 mo. 30°C	22-22.5+37-39 mm
M. olivieri	>2	2-4	6-8x10-13 mm		23-25+33 mm
M. pasteuri	>2	3	5-6x10-10.5 mm 0.195-0.2 g	45 d. "natural; conditions"	21-24+38-46 mm 0.225-0.245 g
M. rubropunctata	2-3(4)	4-5 (3-7)	5-9x9-12 mm 0.205-0.33 g	in April 64 d.; "natural conditions"; later 42 d.	24-28+36-47 mm, 0.26-0.41 g; 26+44 mm, 0.37 g (avg.)

Apart from for an occasional comment like 4 oviductal eggs in April in a specimen in the United Arab Emirates (ARNOLD 1984), no synopsis of reproductive data for *M. brevirostris* exists. Except for the higher number of clutches/year, which in my experience is often under-reported because of incidental observations, and the quite unexpected lengthy incubation reported for *M. guttulata*, the new data on *M. brevirostris* presented here fall nicely within what is known from literature of four other *Mesalina* species (see Tab. 5).

Fig. 5. *Mesalina brevirostris*, male, detail of head. (Photo: H.A.J. IN DEN BOSCH)

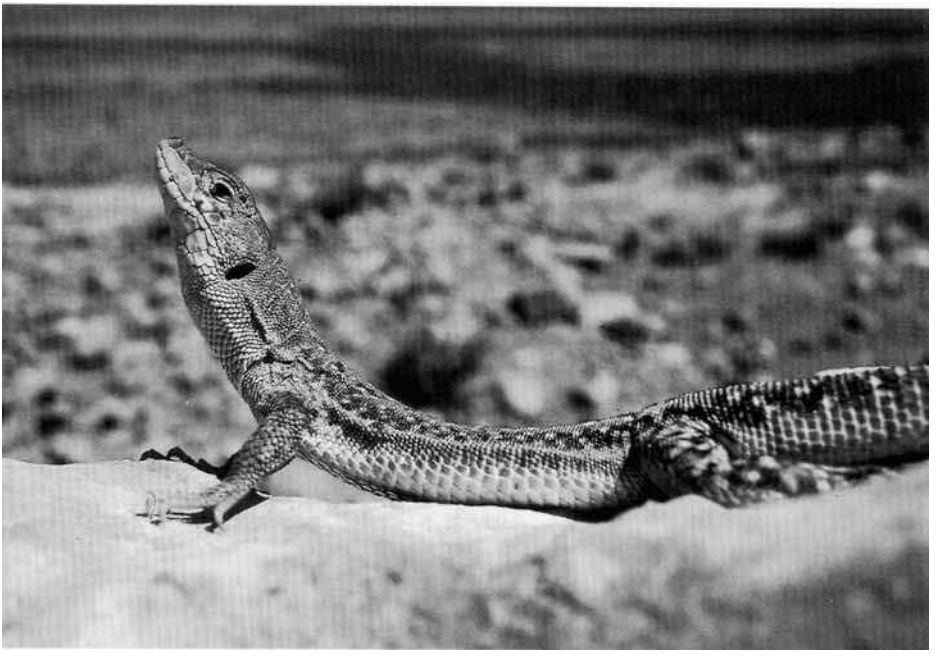

Fig. 6. *Mesalina brevirostris*, male in habitat near Hermel, Lebanon. (Photo: H.A.J. IN DEN BOSCH)

Juvenile *M. brevirostris* are active lizards and resemble the parents, though with a somewhat lighter pinkish brown dorsal colouration (sometimes even more greyish). With much of the small black dots and consequent striped impression of the adult markings missing, the snout and front-dorsal surface of the legs and toes seem to have an orange tinge, the tail is similarly coloured as the back but after 10–15 mm changes distally into light bluish grey (Fig. 4). Laterally the distal half/one third of the tail is of a very light blue. Ventral colouration is pearly white, on belly and tail slightly bluish. After two to three weeks the orange aspect of the legs disappears, instead the hindlegs (except the frontal part of the thighs) now show a decidedly blue colour especially when observed from the front (from above or the side the area generally looks greyish). After five to six weeks the blue gradually fades into grey or light brown but this area is still a distinctly different colour than the rest of the body.

Assuming the clutch of the wild-caught female in mid-June was her first, the earliest juveniles are expected in Lebanon around late July. In 2000 she started laying considerably earlier, almost certainly because the animals had been kept at room temperature, while in the field temperatures in winter and early spring are significantly lower. Nonetheless, the number of clutches remained the same. In eastern Saudi Arabia, with an earlier and warmer summer, juvenile *M. brevirostris* already appear in May/June (ROSS 1988).

Although young *M. brevirostris* are sexually mature in one year, as exemplified by oviposition of the female (4) in 2000 and successful copulations by the male (3), they are obviously not yet fully grown, as also indicated by further growth of the wild-caught specimens.

In conclusion, this Saharo-Sindian lizard should be added to the herpetofaunal list of Lebanon (IN DEN BOSCH 1998). Sadly, its habitat, the ostensibly for humans unattractive hamada around Hermel, is quickly being turned into large melon patches with the aid of irrigation. This alteration, and indirectly the consequent advance of *O. elegans*, could pose a threat to the survival of *M. brevirostris* in Lebanon.

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References

ANDERSON, S.C. (1999): The lizards of Iran. – Contributions to Herpetology (SSAR) 15: 1-442, Ithaca (New York).

ANGEL, F. (1936): Reptiles et batraciens de Syrie et de Mésopotamie récoltés par M. P. Pallary. – Bulletin de l'Institute d'Égypte 18: 107–116, Cairo.

ARNOLD, E. N. (1983): Osteology, genitalia and the relationships of *Acanthodactylus* (Reptilia: Lacertidae). – Bulletin British Museum of natural History, Zoology, 44(5): 291–339, London.

ARNOLD, E. N. (1984): Ecology of lowland lizards in the eastern United Arab Emirates. – Journal of Zoology, London 204: 329–354, London.

ARNOLD, E. N. (1986a): A key and annotated check list to the lizards and amphisbaenians of Arabia. – Fauna Saudi Arabia 8: 385–435, Basle & Riyahd.

ARNOLD, E. N. (1986b): The hemipenis of lacertid lizards (Reptilia: Lacertidae): structure, variation and systematic implications. – Journal of Natural History 20: 1221–1257, London.

BEDRIAGA, J. VON (1880): Verzeichniss der Amphibien und Reptilien Vorder-Asiens. – Bulletin de la Societé impériale des naturalistes de Moscou 54(3): 22–52, Moscow.

BISCHOFF, W. & J. F. SCHMIDTLER (1994): Ergebnisse zweier Lacertiden-Exkursionen nach Syrien. – Die Eidechse 5(12): 4–22, Bonn & Bremen.

BÖTTGER, O. (1880): Die Reptilien und Amphibien von Syrien, Palaestina und Cypern. – Jahresberichte der Senckenbergischen naturforschenden Gesellschaft 1879/80, III-IV, 1–85, pls. III-IV, Frankfurt a. M.

BOSCH, H. A. J. IN DEN (1990): *Lacerta parva*. Courtship and reproduction. – Herpetological Review 21(1): 20, Oxford (Ohio).

BOSCH, H. A. J. IN DEN (1998): Prodromus Amphibiorum et Reptiliorum Phoeniciae. – Faunistische Abhandlungen des staatlichen Museums für Tierkunde Dresden 21 (Suppl. 2): 9–17, Dresden.

BOSCH, H. A. J. IN DEN & E. N. ARNOLD (1996): De Algerijnse Roodstaartfranje-teenhagedis (*Acanthodactylus erythrurus belli*): voortplanting en staartkleur jongen. – Lacerta 54: 153–160, Leiden.

BOSCH, H. A. J. IN DEN & R. G. BOUT (1998): Relationships between maternal size, egg size, clutch size and hatchling size in European lacertid lizards. – Journal of Herpetology 32(3): 410–417, St. Louis.

BOULENGER, G. A. (1921): Monograph of the Lacertidae. Vol. II. – Trustees British Museum (Natural History), London.

DISI, A. M. & W. BÖHME (1996): Zoogeography of the amphibians and reptiles of Syria, with additional new records. – Herpetozoa 9: 63–70, Vienna.

DOUMERGUE, F. (1901): Essai sur la faune erpétologique de l'Oranie. – Imprimerie Typographique Fouque, Oran.

GAUTHIER, R. (1966): La reproduction d'*Eremias* (*Mesalina*) *rubropunctata* (Licht.) (Lacertidae). Le jeunes et leur croissance. – Bulletin IFAN 28, sér. A(4): 1620–1629.

GÜNTHER, A. (1864): Report on a collection of reptiles and fishes from Palestine. – Proceedings of the zoological Society of London 49: 488–493, London.

HAAS, G. (1951): On the present state of our knowledge of the herpetofauna of Palestine. – Bulletin Research Council of Israel 1: 67–95, Jerusalem.

HAAS, G. (1957): Some amphibians and reptiles from Arabia. – Proceedings of the California Academy of Sciences, Ser. 4, 29(3): 47–86, San Franciso.

HAAS, G. & Y. L. WERNER (1969): Lizards and snakes from southwestern Asia, collected by Henry Field. – Bulletin of the Museum of Comparative Zoology, Harvard University, 138(6): 327–405, Harvard.

LEVITON, A. E., S. C. ANDERSON, K. ADLER & S. A. MINTON (1992): Handbook to Middle East amphibians and reptiles. – Contributions to Herpetology (SSAR) 8: 1–252, Oxford (Ohio).

LORTET, L. (1883): Études zoologiques sur la faune du lac de Tibériade suivie d'un aperçu sur la faune des lacs d'Antioche et de Homs. I. Poissons et reptiles du lac de Tibériade et de quelques autres parties de la Syrie. – Archives du Muséum d'Histoire naturelle de Lyon 3: 99–189, pls 6–14, Lyon.

MARTENS, H. (1997): A review of "Zoogeography of amphibians and reptiles of Syria, with additional new records" (Herpetozoa 9 (1/2), 1996). – Herpetozoa 10: 99–106, Vienna.

MORAVEC, J. (2001): Distribution and morphological variation of the lizard *Mesalina brevirostris* in Syria. – Abstracts 4th international Symposium Lacertids in the Mediterranean Basin: 32–33, Mahon, Menorca.

MORAVEC, J. & D. MODRÝ (1994): New herpetological records for Syria. – Acta Universitatis Carolinae biologica 38: 59–64, Praha.

MORAVEC, J., S. BAHA EL DIN, H. SELIGMANN, N. SIVAN & Y. L. WERNER (1999): Systematics and distribution of the *Acanthodactylus pardalis* group (Lacertidae) in Egypt and Israel. – Zoology in the Middle East 17: 21–50, Heidelberg.

PERACCA, M. G. (1894): Viaggio del Dr. Festa in Palestina, nel Libano e regione vicini. – Bollettino del Museo di Zoologia anatomica comparata della Universita di Torino 9(167): 1–20, Turin.

ROSS, W. (1988): Observations on three species of *Mesalina* (Reptilia: Lacertidae) from eastern Saudi Arabia. – Fauna Saudi Arabia 9: 451–456, Basle & Riyahd.

SALVADOR, A. (1982): A revision of the lizards of the genus *Acanthodactylus* (Sauria: Lacertidae). – Bonner zoologische Monographien 16: 1–167, Bonn.

SCHLEICH, H. H., W. KÄSTLE & K. KABISCH (1996): Amphibians and reptiles of North Africa. – Königstein.

SZCZERBAK, N. N. (1974): Yaschurki palearcktiki [The palearctic desert lizards]. – Akademia Nauk, Ukrainsko SSR Institut zoologii, Naukova dumka, Kiev.

TRISTRAM, H. B. (1884): The survey of western Palestine. The fauna and flora of Palestine. – The Committee of the Palestine Exploration Fund, London.

WEBER, N. A. (1960): Some Iraq amphibians and reptiles with notes on their food habits. – Copeia 1960(2): 153–154, New York.

WERNER, F. (1935): Im Auto durch Syrien. – Blätter zur Aquarien- und Terrarienkunde 46(8): 225–227, Magdeburg.

WERNER, Y. L. (1971): Lizards and snakes from Transjordan, recently acquired by the British Museum (Natural History). – Bulletin of the British Museum (Natural History), Zoology 21(6): 215–256, London.

ZINNER, H. (1967). Herpetological collection trips to the Lebanon 1965 and 1966. – Israel Journal of Zoology 16: 49–58, Jerusalem.

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