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A.K. Nasr, F.M. Momen. A new species of the genus *Cosmolaelaps* Berlese (Acari: Laelapidae) from Egypt. *Acarologia*, 2016, 56 (2), pp.257-264. <10.1051/acarologia/20162238>. <hal-01547261>

**HAL Id: hal-01547261**

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Submitted on 26 Jun 2017

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Previous volumes (2010-2015): 250 € / year (4 issues)

Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d'avenir » programme (Labex Agro: ANR-10-LABX-0001-01)



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## A new species of the genus *Cosmolaelaps* Berlese (Acari: Laelapidae) from Egypt

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(Received 27 October 2015; accepted 01 February 2016; published online 30 June 2016)

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**ABSTRACT** — A new species of Laelapidae, *Cosmolaelaps aegyptiacus* n. sp., associated with roots and leaf litter of soybean *Glycine max* (L.) is described and illustrated based on females from Egypt. A key to the five identified and valid species reported in Egypt, including the new species, is provided.

**KEYWORDS** — Acari; *Cosmolaelaps*; Mesostigmata; new species; identification key

### INTRODUCTION

The family Laelapidae is a morphologically and ecologically diverse group of mites. They have a wide ecological diversity including insect paraphagous, parasites on vertebrates and free-living predators inhabiting soil, litter habitat and nests of vertebrates and arthropods (Evans and Till, 1966; Strong and Halliday, 1994; Lindquist *et al.*, 2009; Kazemi and Rajaei, 2013). Casanueva (1993) revised the family Laelapidae and raised most of the groups and subgenera of *Hypoaspis* sens lat. to generic level. Moreira *et al.* (2014) clearly contribute to the genus *Cosmolaelaps* characterization, resolving problems due to poor and confusing previous descriptions of this genus. To date, about 115 species of *Cosmolaelaps* have been recorded worldwide (Moreira *et al.*, 2014; Fouly and Al-Rehiayani, 2014; Ramroodi *et al.*, 2014). The literature shows that most species of *Cosmolaelaps* are encountered in soil and litter, a few being associated to arthropods

and nests of mammals.

The purpose of this study is to describe a new species of *Cosmolaelaps*, contributing thus to knowledge of Laelapidae Egyptian fauna.

### MATERIALS AND METHODS

Mite specimens were extracted from soil sampled in soybean fields using Berlese-Tullgren funnels. Mites were cleared in Nesbitt solution and mounted in Hoyer's medium. The specimens were examined under a phase contrast microscope; the camera Lucida apparatus was used for the drawings. The measurements are presented in micrometers ( $\mu\text{m}$ ) as minimum- maximum range or in a single mean value. Dorsal shield length and width were taken from anterior to posterior margins along the midline, and at broadest level, respectively. Width of the sternal shield was measured for female at level of st2-st2. Length of epigynal shield was measured along the midline from the anterior margin of the

epyginal shield to sternal shield, and the width at the widest point. Legs measurements were taken from coxa basis to tarsus apex, excluding the pretarsus. The length of the movable cheliceral digit was taken from basis to apex. Setae were measured from basis of their insertions to their tips. Idiosomal setal-nomenclature follows that of Lindquist and Evans (1965), the leg chaetotaxy that of Evans (1963), and names of other anatomical structures mostly follow Evans and Till (1979). We use the terms (lyrifissures) to refer to slit-shaped sensilli, and (pores) for circular or oval-shaped cuticular opening of unspecified function.

## RESULTS

### Genus *Cosmolaelaps* Berlese

*Laelaps (Cosmolaelaps) Berlese 1903: 13*

*Cosmolaelaps Berlese, 1920: 157*

Type species: *Laelaps claviger* Berlese, 1883: 2

Diagnosis — The diagnosis of *Cosmolaelaps* used here is based on that of Moreira *et al.* (2014).

### *Cosmolaelaps egyptiacus* n. sp. (Figs:1-3)

Diagnosis — dorsal shield oval, covering totally idiosoma, with 39 pairs of setae, and 3 unpaired setae between J series; setae z1 short and simple, j1 stout and smooth, Z5 barbed. Epistome triangular, reticulated (raising striation) with half anterior margin denticulated, posteriorly.

Internal malae coarsely fringed, with two pairs of lobes, inner one narrow, tapered, hairy in the outer side, and outer lobes coarsely fringed (with 7-9 arms). Metasternal shields present with st4 and lyrifissures (iv3). Epyginal shield flask-shaped, ornamented with large cells in the central part, bordered by two lines forming an inverted v-shaped and with lateral margin expanded to midline of coxa IV. Fixed digit of chelicerae with five teeth.

Description: Female, light brown in color when alive.

Dorsal idiosoma (Fig. 1a) — Dorsal shield 371 – 395 long and 282 – 292 wide, oval shaped, weakly reticulated with scale-like pattern in opisthotal

region and few polygonal and semi-circular pattern reticulation on anterior shield; bearing 39 pairs of scimitar-like setae, except for Z5 barbed at 3/4 length, seta j1 stout and smooth and seta z1 short and simple; 22 pairs (j1-j6, z1-z6, s1-s6 and r2-r5, r6 located latero-ventrally) on podonotal area, and 17 pairs (J1-J5, Z1-Z5, Zx2, Zx3, and S1-S5) on opisthotal area, opisthotal region bearing three additionally unpaired posterior-median setae (Jx2-Jx4); eighteen pairs of pore-like structures. Lengths of dorsal setae are shown in Table 1.

Gnathosoma (Fig. 1b, c) — Hypostome bearing four pairs of simple setae (Fig. 1c). Epistome (Fig. 1b) triangular, reticulated raising striation, denticulated posterior half. Hypostomal groove with six transverse rows of denticles, each having 12 – 18 small teeth and smooth anterior and posterior lines. Corniculi 11 – 15 long, robust and horn-like, reaching the mid-level of palp femur. Internal malae complex-fringed, with two separated pairs of lobes, inner one, narrow, tapered, with fine hairs on outer-side, while outer lobes coarsely fringed with 7 – 9 arms. Labrum elongated, subtriangular, with pilose surfaces and extending to middle level of palp-genu. Chelicera (Fig. 1d) - Fixed digit of chelicera with five teeth and terminal hook, a pilus denticilis short and setiform, movable digit 18 – 22 long, bidentated, plus terminal hook; arthrodistal corona fringe-like.

Palp chaetotaxy (Fig. 1e) — trochanter (2)- femur (5)- genu (6)- tibia (14)-tarsus (15); tarsal claw 2-tined (Fig. 1f), all setae smooth, simple except setae al1 stout, and al2 on genua and al, ad on femur, thick and spine-like.

Ventral idiosoma (Fig. 2) — Tritosternal basis 18 long, with two free pilose laciniae 45 long; presteral region weakly sclerotized (undefined plates) with some weak transverse lines. Sternal shield narrow between coxae II, widest between coxae II and III (118 – 127), undefined and finely reticulated anteriorly, concaved and smooth posteriorly, bearing three pairs of simple setae (st1 =36, st2 = 29, st3 =33; distances between st1-st1=54, st2-st2= 63, st3-st3= 95), and two pairs of lyrifissures (1st pair oriented transversely, 2nd oriented obliquely). Endopodal plates II-III completely fused to ster-

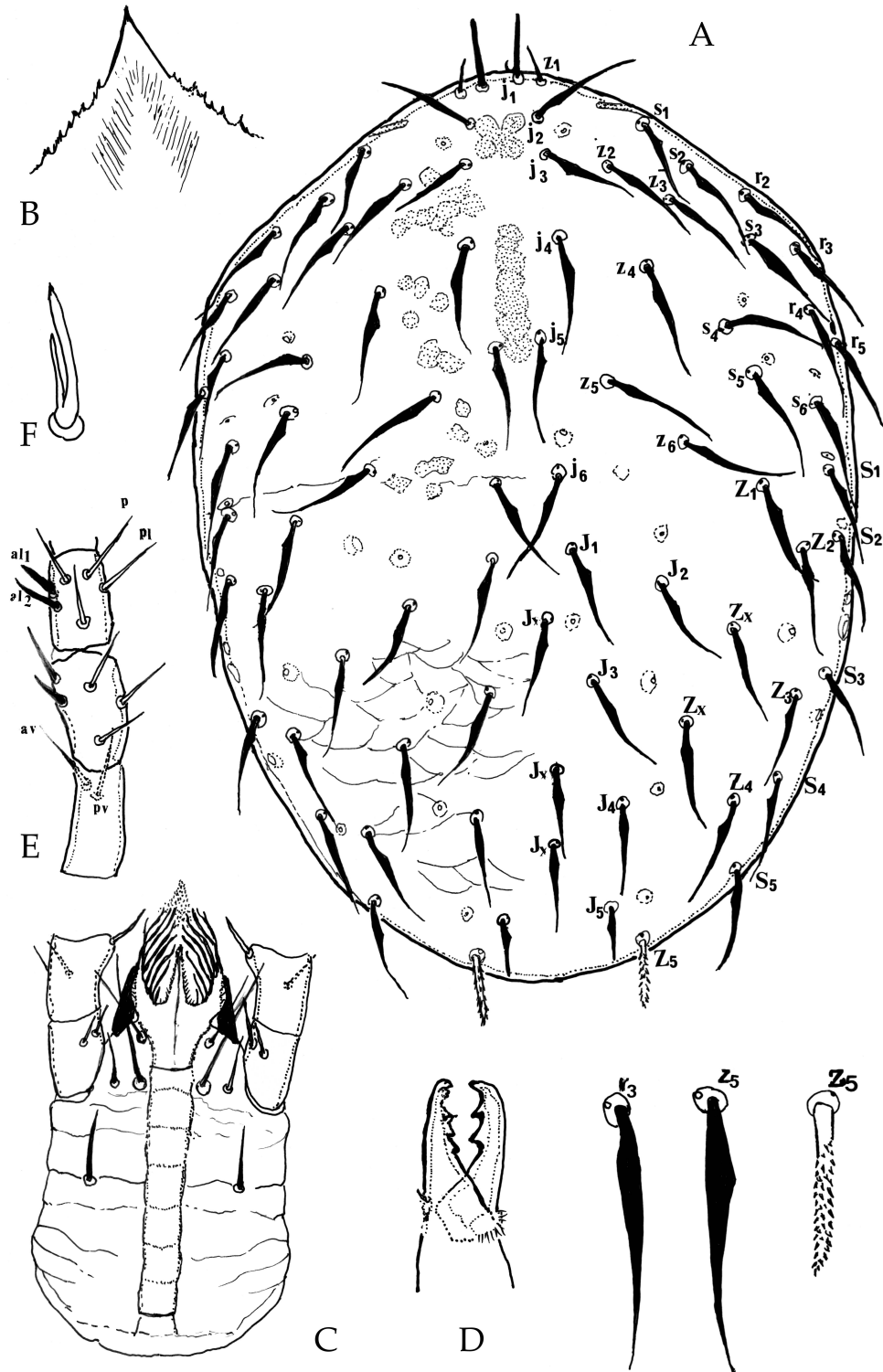


FIGURE 1: Dorsal shield of *Cosmolaeaps aegyptiacus* n. sp.: A – dorsal idiosoma, B – epistome, C – hypostome, D – chelicerae, E – palp, F – tined claw.

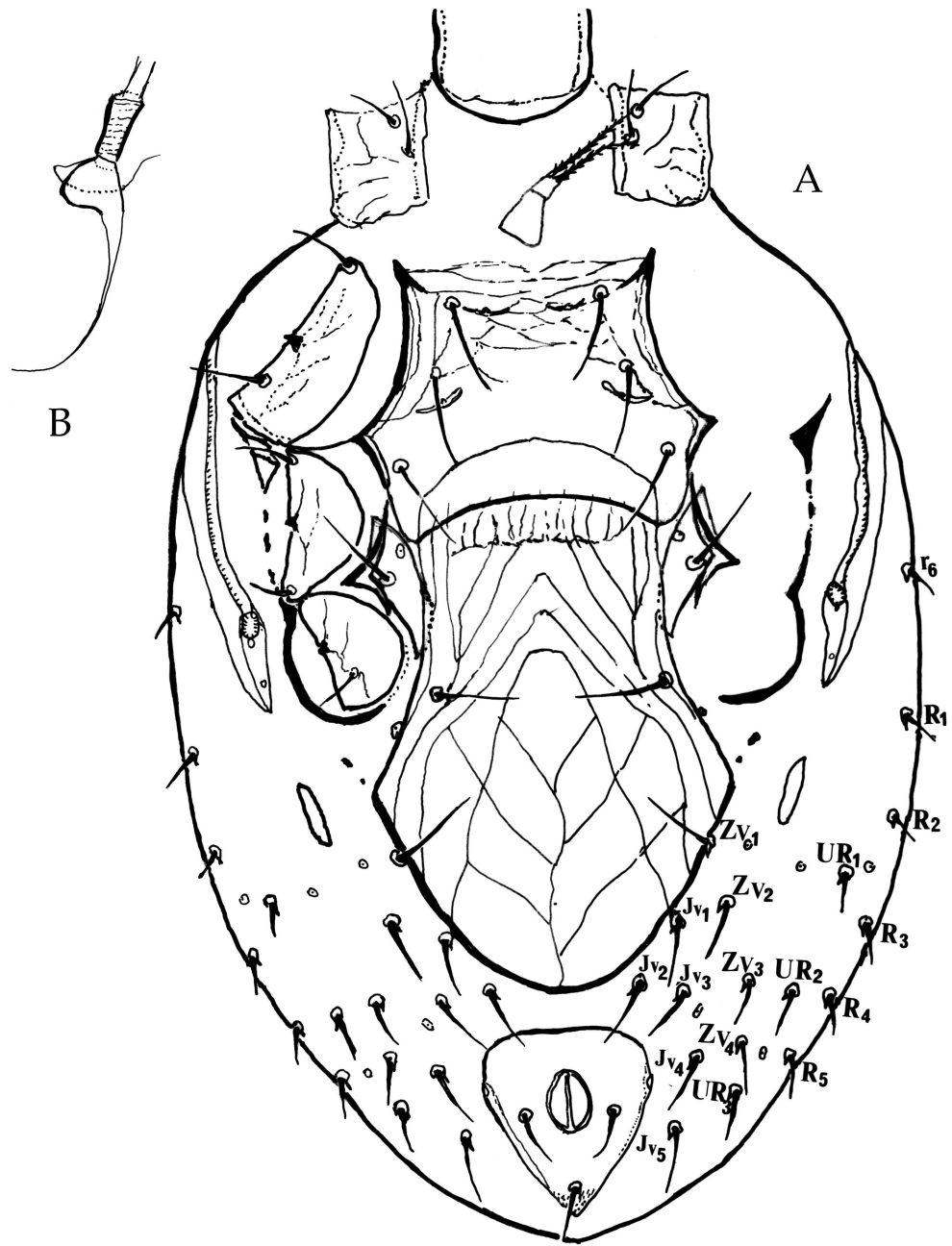


FIGURE 2: Ventral shield of *Cosmolaeaps aegyptiacus* n. sp.: A – ventrum, B – spermatheca.



TABLE 1: Lengths of dorsal, ventral and gnathosomal setae of *Cosmolaelaps aegyptiacus* n. sp.; capitulum setae (s.c), postanal setae (postanal s.)

Setae	Length	Setae	Length	Setae	Length	Setae	Length
j1	30 – 36	z1	15 – 18	s1	39 – 42	-	
j2	50 – 55	z2	36 – 39	s2	43 – 47	r2	42 – 46
j3	41 – 43	z3	40 – 45	s3	45 – 50	r3	43 – 47
j4	45 – 48	z4	49 – 54	s4	45 – 48	r4	45 – 50
j5	40 – 44	z5	46 – 48	s5	45 – 50	r5	40 – 44
j6	46 – 49	z6	43 – 48	s6	43 – 48	r6	13 – 15
J1	43 – 46	Z1	44 – 46	S1	44 – 50	R1	13 – 15
J2	43 – 46	Z2	43 – 46	S2	40 – 46	R2	11 – 14
J3	42 – 46	Z3	40 – 45	S3	39 – 44	R3	12 – 14
J4	37 – 44	Z4	46 – 51	S4	45 – 50	R4	15 – 17
J5	21 – 25	Z5	28 – 31	S5	43 – 49	R5	14 – 16
Jx2	35 – 39	Zx1	43 – 48	-		UR1	13 – 16
Jx3	33 – 38	Zx2	45 – 50	St1	35 – 39	UR2	21 – 26
Jx4	33 – 35	Zv1	27 – 32	St2	35 – 41	-	
Jv1	24 – 29	Zv2	20 – 22	St3	36 – 40	h1	18 – 24
Jv2	27 – 33	Zv3	16 – 19	St4	31 – 34	h2	17 – 21
Jv3	20 – 24	Zv4	17 – 22	St5	35 – 37	h3	41 – 46
Jv4	20 – 23	Zv5	20 – 25	paranal s.	28 – 32	c.s.	20 – 25
Jv5	24 – 29			postanal s.	28 – 32		

nal shield, while endopodal III–IV elongate, narrow and curved; metasternal plates, subtriangular and bearing metasternal (st4) and metasternal lyrifissures (iv3) (Fig.2a ). Epyginal shield 173 – 195 long and 122 – 131 wide, ornamented with large cells in the central part, bordered by two lines forming an inverted v-shaped, bearing a pair of simple setae (st5); lateral margin of epyginal shield extended to middle line of coxa IV, epyginal shield separated from anal shield by a distance of 13-17. Genital lyrifissures (iv5) located on integument lateral to shield, posteriolaterad of st5; a pair of rod-shaped platelets present next to edges of epyginal shield; exopodal platelets represented by two triangular exopodal platelets between coxa II–III and III–IV, connected by an interrupted stripe, and an arched platelet partially surrounding external and posterior of coxa IV. All lengths of ventral setae are shown in Table 1.

Opisthogastric integument — with five pairs of pores-like structures and 12 pairs of simple setae which are: UR1-UR3, Zv1-Zv4 and Jv1-Jv5, each

arising on small sclerotized platelet, anal shield, subtriangular, 64 – 75 long and 52 – 65 wide, with a pair of lateral pore-like (gv3); cribrum well developed, extending to anterior level of post anal seta.

Metapodal plates (12 – 15) oblong, oriented parallel with genital shield, with two pairs of spotted platelets behind coxa IV.

Peritreme — peritremal shield fused to dorsal shield near z1, with two pairs of pores behind stigmata; peritreme, extending between s1 and z1.

Spermatheca (Fig: 2b) — Insemination duct, long, opening between coxa III-IV, sacculus irregular, with long, curved and tapering extension; each duct entering in sclerotized tube (atrium) and having one minor duct.

Legs (Fig. 3) — Tarsi I-IV with two tiny claws and a round membranous pulvillus. Leg lengths: I (352 – 375), II (276 – 296), III (238 – 252), IV (325 – 333), legs finely reticulated. Legs chaetotaxy as follows:

Leg I: coxa (0-0/1-0/1-0) setae simple, trochanter (1-0/1-1/2-1) av thick and spine-like, femur (2-3/1-

TABLE 2: Comparison of *Cosmolaelaps aegyptiacus* n. sp. to related species

Species	<i>C. aegyptiacus</i> n. sp.	<i>C. qassimensis</i> Fouly & Al-Rehianyani	<i>C. vacua</i> (Michael)	<i>C. acuta</i> (Michael)
1)- Dorsal shield	With 39 pairs of setae Covering completely the idiosoma	With 39 pairs of setae Not covering completely the idiosoma	With 39 pairs of setae Covering completely the idiosoma	37 pairs of setae Covering completely the idiosoma
2)- Tectum	Triangular with radiating lines	Triangular with irregularly dentition margin	Lateral margin denticulated	Triangular
3)- Hypostomal groove	6+2 lines anterior and posterior lines smooth	7 +1 line smooth	6-7 only	5 + 1 line smooth
4)- Number of teeth on the fixed digit of chelicerae	5	7	5	4
5)- Metasternal shield	Present	Absent	Absent	Absent
6)- Genital shield	Flask- shape, with expanded lateral margin to mid- line of coxae IV	Tungu -like not expanded to coxae IV	Tungu -like not expanded with parallel sides	Tungu -like not expanded with parallel sides
7)- Shape of setae Z5	Barbed	Scimitar- like	Scimitar- like	Scimitar- like
8)- Unpaired seta (Jx)	3	3	2	3-4

2/3-2)ad1 stout, ad3 thick-spiny, pd1 and pd2 thin and short, all ventral setae thick and long, genu (2-3/2-3/1-2) pl1 stout and thick-spiny, tibia ( 2-3/2-3/1-2), pl1 stout and thick-spiny.

Leg II: coxa (0-0/1-0/1-0), trochanter (1-0/2-0/1-1) al thicker-spiny, femur (2-3/1-2/2-1),al2, ad2 thin and short, ad1 and pd1, pl and pd2 stout-spiny, genu (2-3/1-2/1-2) all setae thick-spiny with ad2 and pv slightly longer, tibia (2-2/1-2/1-2), pv thick.

Leg III: coxa (0-0/1-0/1-0), trochanter (1-0/1-0/2-1), femur (1-2/1-1/0-1) ad1 stout, al longer, av thin and short,genu (2-2/1-2/1-1) pd2 shorter and thinner, remain setae thicker and spiny, tibia (2-1/1-2/1-1).

Leg IV: coxa (0-0/1-0/0-0), trochanter (2-1/1-0/1-1)av stout and thicker, femur (1- 2/1- 1/0-1) ad1 stout and thicker, pl thin and short, genu (2-2/1-3/0-1) all setae thick-spiny, av and al1 longer, tibia (2-1/1-3/1-2), all setae thick-spiny.

Tarsi I-IV with 18 setae (3-3/2-3/2-3 +mv +md), all setae thick, spine-like and nearly uniform in shape except setae of tarsus IV slightly longer.

**Key to species of *Cosmolaelaps* occurring in Egypt**

1. Dorsal shield with 40 pairs of setae (r6 on dorsal-shield) . . . . . *C. keni* Hafez, El-Badry & Nasr (1982)  
— Dorsal shield with 39 pairs of setae (r6 off dor-

salshield) . . . . . 2  
2. Dorsal shield totally covering the idiosoma; metasternal shield present . . . . . *C. aegyptiacus* n. sp.  
— Dorsal shield uncovering the idiosoma; metasternal shield absent . . . . . 3  
3. Epyginal shield flask-like, four unpaired setae present between J series; anal shield pan-like. . . . . *C. zachvatkinae* Shereef & Afifi (1980)  
— Epygenal shield tungua-like; two unpaired setae present between J series; anal shield subtriangular. . . . . 4  
4. Dorsal shield oval; setae ad1 and ad2 on femur II, and IV and ad1 on femur III, bifurcated with fine membrane . . . . . *C. paravacua* Nasr & Nawar (1989)  
— Dorsal shield elliptical; setae of femura of legs simple or thick and spine-like. . . . .  
. . . . . *C. longus* Hafez, ElBadry & Nasr (1982)

Material examined — Holotype female collected on 9 August 2013 by M. A. K. Nasr from soil in Soybean crop *Glycine max* (L.), Menia Governorate far from Cairo about 250 Km (about 1.5 Km W of Menia: 3.74 longitude; 28.11 latitude). Two paratypes with the same data. All the specimens preserved as permanent slides, and deposited within the collection of Acarological unit, Pests & Plant Protection Department at National Research Centre, The


Cairo, Egypt.

Remarks — According to classification of Karg (1988), *C. aegyptiacus* n. sp. would belong to *C. nasoseta* species group. According to Moreira *et al.* (2014), species of this genus have metasternal shield absent except in *C. brevilingua* (Karg, 2006), which has minute metasternal plates. In *C. aegyptiacus* n. sp., this shield is clear and wide (Fig.2a) (examination was done by crashing one of our paratypes). Thus, the presently described new species is the second species within the genus *Cosmolaelaps* having this character. The table 2 provides a comparison between the new species *C. aegyptiacus* and other morphologically close species. The new species differs from the known species by having a wide subtriangular metasternal shield. It differs mainly from *C. qassimensis* by having 5 teeth on movable digit, Z5 barbed and the epigynal shield is flask-shape with expanded lateral margin (while *C. qassimensis* has 7 teeth on movable digit, setae Z5 scimeter-like and epigynal shield tongue-like). *C. aegyptiacus* n. sp. is close to *C. vacua*, but mainly differs by epigynal shield tongue-like not expanded and seta Z5 scimeter-like. *Cosmolaelaps aegypticus* n. sp. is close to *C. acuta* but differentiated by having 37 pairs of dorsal shield and the shape of tongue-like epigynal shield. Finally, it can be distinguish from *C. confinisetarum* by the acuminate tectum, flask-like, not expanded epigynal shield and setae Z5 lightly serrate.

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