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

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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

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**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 (µm) 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...
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epyginal shield to sternal shield, and the width at the widest point. Legs measurements were taken from coxa basis to tarsus apex, excluding the pre-tarsus. 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 opisthonotal 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 j1stout 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 opisthonotal area, opisthonotal 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 dentilis short and setiform, movable digit 18 – 22 long, bidentated, plus terminal hook; arthrodial 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 a1 on genu and ad on femur, thick and spine-like.

Ventral idiosoma (Fig. 2) — Tritosternal basis 18 long, with two free pilose laciniae 45 long; presternal 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 2: Ventral shield of Cosmolaeaps aegyptiacus n. sp.: A – ventrum, B – spermatheca.
FIGURE 3: Dorsal view of femur, genua, tibia I-IV of Cosmolaeops aegyptiacus n. sp.
Table 1: Lengths of dorsal, ventral and gnathosomal setae of *Cosmolaelaps aegyptiacus* n. sp.; capitulum setae (s.c), postanal setae (postanal s.)

<table>
<thead>
<tr>
<th>Setae</th>
<th>Length</th>
<th>Setae</th>
<th>Length</th>
<th>Setae</th>
<th>Length</th>
<th>Setae</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>j1</td>
<td>30 – 36</td>
<td>z1</td>
<td>15 – 18</td>
<td>s1</td>
<td>39 – 42</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>j2</td>
<td>50 – 55</td>
<td>z2</td>
<td>36 – 39</td>
<td>s2</td>
<td>43 – 47</td>
<td>r2</td>
<td>42 – 46</td>
</tr>
<tr>
<td>j3</td>
<td>41 – 43</td>
<td>z3</td>
<td>40 – 45</td>
<td>s3</td>
<td>45 – 50</td>
<td>r3</td>
<td>43 – 47</td>
</tr>
<tr>
<td>j4</td>
<td>45 – 48</td>
<td>z4</td>
<td>49 – 54</td>
<td>s4</td>
<td>45 – 48</td>
<td>r4</td>
<td>45 – 50</td>
</tr>
<tr>
<td>j5</td>
<td>40 – 44</td>
<td>z5</td>
<td>46 – 48</td>
<td>s5</td>
<td>45 – 50</td>
<td>r5</td>
<td>44 – 44</td>
</tr>
<tr>
<td>j6</td>
<td>46 – 49</td>
<td>z6</td>
<td>43 – 48</td>
<td>s6</td>
<td>43 – 48</td>
<td>r6</td>
<td>13 – 15</td>
</tr>
<tr>
<td>j7</td>
<td>43 – 46</td>
<td>Z1</td>
<td>44 – 46</td>
<td>S1</td>
<td>44 – 50</td>
<td>R1</td>
<td>13 – 15</td>
</tr>
<tr>
<td>j8</td>
<td>43 – 46</td>
<td>Z2</td>
<td>43 – 46</td>
<td>S2</td>
<td>40 – 46</td>
<td>R2</td>
<td>11 – 14</td>
</tr>
<tr>
<td>j9</td>
<td>42 – 46</td>
<td>Z3</td>
<td>40 – 45</td>
<td>S3</td>
<td>39 – 44</td>
<td>R3</td>
<td>12 – 14</td>
</tr>
<tr>
<td>j10</td>
<td>37 – 44</td>
<td>Z4</td>
<td>46 – 51</td>
<td>S4</td>
<td>45 – 50</td>
<td>R4</td>
<td>15 – 17</td>
</tr>
<tr>
<td>j11</td>
<td>21 – 25</td>
<td>Z5</td>
<td>28 – 31</td>
<td>S5</td>
<td>43 – 49</td>
<td>R5</td>
<td>14 – 16</td>
</tr>
<tr>
<td>jx2</td>
<td>35 – 39</td>
<td>Zx1</td>
<td>43 – 48</td>
<td>-</td>
<td>UR1</td>
<td>13 – 16</td>
<td></td>
</tr>
<tr>
<td>jx3</td>
<td>33 – 38</td>
<td>Zx2</td>
<td>45 – 50</td>
<td>St1</td>
<td>35 – 39</td>
<td>UR2</td>
<td>21 – 26</td>
</tr>
<tr>
<td>jx4</td>
<td>33 – 35</td>
<td>Zv1</td>
<td>27 – 32</td>
<td>St2</td>
<td>35 – 41</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>jv1</td>
<td>24 – 29</td>
<td>Zv2</td>
<td>20 – 22</td>
<td>St3</td>
<td>36 – 40</td>
<td>h1</td>
<td>18 – 24</td>
</tr>
<tr>
<td>jv2</td>
<td>27 – 33</td>
<td>Zv3</td>
<td>16 – 19</td>
<td>St4</td>
<td>31 – 34</td>
<td>h2</td>
<td>17 – 21</td>
</tr>
<tr>
<td>jv3</td>
<td>20 – 24</td>
<td>Zv4</td>
<td>17 – 22</td>
<td>St5</td>
<td>35 – 37</td>
<td>h3</td>
<td>41 – 46</td>
</tr>
<tr>
<td>jv4</td>
<td>20 – 23</td>
<td>Zv5</td>
<td>20 - 25</td>
<td>paranal s.</td>
<td>28 - 32</td>
<td>c.s.</td>
<td>20 - 25</td>
</tr>
<tr>
<td>jv5</td>
<td>24 - 29</td>
<td>postanal s.</td>
<td>28 - 32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 (gyv3); 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 stigma; 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

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

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), pl2 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 thick 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 all longer, tibia (2-1-3/1-2), 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 dorsalshield) ....... C. keni Hafez, El-Badry & Nasr (1982)
   — Dorsal shield with 39 pairs of setae (r6 off dorsalshield) .......................... 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)
   — Epyginal 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 femurIII, bifurcated with fine membrane ...... C. paraacuta 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
C. con-
shield. Finally, it can be distinguish from dorsal shield and the shape of tongue-like epigynal

C. qassimensis Z5 barbed and the epigynal shield is flask-shape

expanded epigynal shield and setae Z5 lightly ser-

finisetarum by the acuminated tectum, flask-like, not

to C. acuta

C. aegyptiacus

has 7 teeth on movable digit, setae Z5 scimiter-like

C. qassimensis by having 5 teeth on movable digit,

triangular metasternal shield. It differs mainly from

this character. The table 2 provides a comparison

between the new species C. aegyptiacus and other morphologically close species. The new species dif-

fers from the known species by having a wide sub-

triangular metasternal shield. It is close to

C. vacua

C. aegyptiacus

is close to

sp.

C. aegyptiacus

has minute metasternal plates. In

C. brevilingua

absent except in

(2014), species of this genus have metasternal shield

between the new species

and other species group. According to Moreira

Karg, 2006), which

would belong to

Cosmolaelaps 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 sec-

ond 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 dif-

fers from the known species by having a wide sub-

triangular 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 scimiter-like and epigynal shield tongue-like). C. aegyptiacus n. sp. is close to C. acuta, but mainly differs by epig-

ynal shield tongue-like not expanded and seta Z5 scimiter-like. Cosmolaelaps aegyptiacus n. sp. is close to C. acuta but differentiated by having 37 pairs of
dorsal shield and the shape of tongue-like epigynal

Finally, it can be distinguish from C. confinisetarum by the acuminated tectum, flask-like, not expanded epigynal shield and setae Z5 lightly ser-

rate.

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