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FOUR NEW SPECIES OF EUPODID MITES FROM EGYPT
(ACARI: EUPODOIDEA: EUPODIDAE)

BY B. A. ABOU-AWAD¹, B. M. EL-SAWAF²
& A. A. ABDEL-KHALEK¹
(Accepted January 2006)

EUPODIDAE EUPODES COCCEUPODES

SUMMARY: Four eupodid mites, *Eupodes zaheri* n. sp., *E. bakeri* n. sp., *Cocceupodes sharkiensis* n. sp. and *Linopodes barnufi* n. sp. are described and illustrated.

RÉSUMÉ : Quatre eupodides sont décrits et illustrés *Eupodes zaheri* n. sp., *E. bakeri* n. sp., *Cocceupodes sharkiensis* n. sp. et *Linopodes barnufi* n. sp.

INTRODUCTION

Members of the Eupodoidea are terrestrial and cosmopolitan in distribution. The greatest numbers of eupodoid species are found in the top layers of grassland and woodland soils, where a wide range of habitats such as semiarid terrestrial localities, habitats with prevailing moist conditions, intertidial coastal regions, arctic regions and steam vents are exploited (Strandtman & Goff 1978). A comprehensive study of the Eupodidae was undertaken to supplement the only previous work by Abou-Awad (1984) and Abou-Awad & El-Bagoury (1984&1985). Through this work, four species were collected belonging to genera *Eupodes*, *Cocceupodes* and *Linopodes*, and described.

MATERIAL & METHODS

Specimens were mounted using Hoyer’s media. Body length of specimens was measured from the posterior margin of the idiosoma to the anterior margin of the naso. Body width was measured as the distance between setae *c*₂ and the lateral margins of the body. Setal lengths represent the distance from the setal base to the tip. All dimensions are given as micrometers. Terminology and setal notation follow those proposed by Lindquist & Zacharda (1987) and Baker (1990). Measurement criteria follow those of Zacharda (1980). Abbreviations are as follows: prodorsal setae: internal vertical (iv), external vertical (ev), trichobothria (T), scapular (sc); opisthosomal setae: internal humeral (c₁), external humeral (c₂); first dorsal (d₁), second dorsal (d₂), internal lumbar (f₁), external lumbar (f₂), internal sacral (h₁), external sacral (h₂); gnathosomal setae: basal subcapitular setae (sbc₁), apical subcapitular setae (sbc₂), cheliceral setae (cha); genital region: aggenital setae (ag), genital setae (g); anal region: adanal setae (a); pseudanal setae (ps); podosomal region: coxal setae (1a 3a, 2a, 3a-3d, 4a-4c). The holotype, allotypes and paratypes of the new species are deposited in the

1. Plant Protection Department, National Research Centre, Dokki, Cairo, Egypt.
2. Entomology Department, Faculty of Science, Ain Shams University, Cairo, Egypt.

Family Eupodidae Koch, 1842
Genus Eupodes Koch, 1835
Eupodes zaheri n. sp.
(Figs. 1-4)

Affinities: This species is related to E. temperatus Shiba and E. longisetatus Strandmann but differs consistently in the subcapitulum, there are two forms (cone shaped or ovoid shaped) in the same species; c1, d1, e, and f1 setae longer than internal distance (sur-passing setae) and all being less than ½ as long as width of the body. Leg I and IV longer than the body. Famulus on tarsi I and dorsomedian solenidion on genua I and II absent.

Female. — (Figs. 1-4). Body length 338-486, body width 203-315. The type specimen 374 long, 230 wide. Idiosoma elliptic. Subcapitulum (Fig. 2A-B) with two forms, either narrowly cone shaped or ovoid shaped, length of first form 77, width 48, ratio length to width 1.60, length of second ones 70, width 57, ratio length to width 1.23. Subcapitulum with two subcapitular setae, sbc2 subapical ventrally and tend toward clavate, sbc1 basilateral and slightly spiculate. Palp (Fig. 2C) four-segmented, terminally slightly acicular, tarsi with eight short setae, short and slender, about ½ as long as tibia and without a basal solenidion, tibia with three pinnated setae, femoro-genu with two dorsal pinnated setae. Fixed digit of chelicera simple and slightly forked, weekly movable digit, one cheliceral seta (cha) smooth and located dorsally just proximal to fixed digit.

Dorsal idiosoma (Fig. 1A). — Sejugal furrow represented by faint line of striae, naso, semi-rounded lobe. Prodorsum subtriangular, surrounded with few faint broken lines just behind naso, with a pair of eye-spots and four pairs of setae: iv 26, ev 33, about ½ as long as T, T 70 slender and minutely ciliated, sc 40 ciliated setae. Internal distances of prodorsal setae: iv-iv 9, ev-ev 64, T-T 59, sc-sc 96. Opisthosoma bears eight pairs of long ciliated setae: c1, d1, e1 and f1 setae longer than distance and each less than ½ as long as width of the body; c2, f2 and h2 shorter. Lengths of opisthosomal setae: c1 88; c2 64; d1 92; e1 92; f1 85; f2 60; h1 84; h2 60. Internal distance: c1-c1 35; c1-c2, 97; c2-c2 218; c1-d1 81; d1-d1 77; d1-e1 62; e1-e1 53; e1-f1 84; f1-f1 18; f1-h1 14; h1-h1 15.

Ventral idiosoma (Fig. 1B). — Coxae in two groups defined. Trochanteral formula 1 1 1 1, epimeral formula I-IV, 3-1-4-3; inner setae of coxa IV 4a not separated from its plate. All coxal setae of about the same length, except 1c, which are simple and shorter, about ½ as long as 1b. Most ventral setae ciliated and blunt. Gential region (Fig. 3B) with seven pairs of aggenital setae, each genital flap with six genital setae, in which the 4th is more lateral than the others. Length of genital cover flaps 73; with two pairs of medium size genital papilla. Anal pore terminal, with three pairs of setae: ps3 18 about ½ length of ps2, ps1 46, the longest.

Legs (Fig. 4). — With finely ciliated setae. Leg I and IV longer than the body. Femur I partially divided; femora III and IV with distinct divisions. Femur IV prominently enlarged, width 68.

Leg chaetotaxy (adult):

<table>
<thead>
<tr>
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<th>Tarsus</th>
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Measurements of leg segments:

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<th>Tarsus</th>
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<td>IV</td>
<td>45</td>
<td>149</td>
<td>63</td>
<td>68</td>
<td>420</td>
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</table>

Length of tarsus I 117; width 13, ratio length to width 9. Length of tarsus II 63; width 15, ratio length to width 4.2. Tarsus I and II (Fig. 2 D-E), each with one rhagidial organ with two rhagidial solenidia in tandem and in a common insertion pit. Famulus of tarsus I absent. Tibia I with apical dorsal rhagidial seta (one dorsodistal solenidion). Solenidion on genua I and II absent. Apotele. Claw longer than pad-like empodium.

Male (Fig. 3 A). — Length of body 369; width of body 203. Sperm sac length 53, large, capitate and shorter than the genital coverflaps, with conspicuous...
ornamentation, aggenital setae relatively longer than in female. Leg I 576. Leg IV 396


Etymology. — The mite is named Dr. M. A. Zaher, Professor of Acarology, Faculty of Agriculture, Cairo University.

Eupodes bakeri n. sp.
(Figs. 5-8)

Affinities: E. bakeri is similar in appearance to E. zaheri in having two forms of the subcapitulum, but differs consistently from the latter by dorsal opisthosomal setae that are shorter than intersetal distances (non-surpassing setae). Rhagidial solenidia are distinct only in tarsus I and II. Chaetotaxy of leg setae and intersetal distance between idiosomal setae are different.

Female (Fig. 5-6). — Length of body 302-410. Width of body 171-265. The type specimen 396 long, 230 wide. Sejugal furrow not prominent, tapers slightly forward to broadly rounded posterior. Subcapitulum (Fig. 6A-B), with two forms, either narrowly cone shaped or ovoid shaped. First form length 70, width 48, ratio length to width 1.46. Second ones length 68, width 59, ratio length to width 1.15. Each subcapitulum with two subcapitular setae, sbc2 subapical, sbc1 basilateral and slightly spiculate setae. Palpus setal formula 0-2-3-8 respectively, spiculate setae. Tarsus of palp short and slender, about ½ as long as tibia and without solenidion. Fixed digit of chelicera simple, slightly forked, cha seta smooth and located dorsally.

Dorsal idiosoma (Fig. 5A). — Sejugal furrow not visible, represented by a faint line just behind trichobothria. Naso, a clear subtriangular lobe. Prodorsum subtriangular with faint broken lines and four pairs of prodorsum setae: iv 20, ev 29, sc 31, about ½ the length of T. Internal distance of prodorsum setae: iv-iv 7, ev-ev 64, T-T 51 and ½ as long as sc-sc. Opisthosoma with eight pairs of short ciliate setae, c1 equal to c2, d1 equal to F2 and e1 equal to h2. Setae lengths: c1 44, c2 45, d1 46, e1 51, f1 59, f2 46, h1 64, h2 51. Internal distance:

\[ c_1-d_1 = 79, c_1-c_1 = 46, c_2-c_2 = 88, c_2-c_2 = 222, d_1-d_1 = 73, e_1-f_1 = 57, f_1-f_1 = 26, f_1-h_1 = 26, h_1-h_1 = 22. \]

Ventral idiosoma (Fig. 5B). — Coxae in two groups defined. Trochanteral setal formula: 1-1-1-1. Epimeral formula 1-IV: 3-1-4-3, inner seta of coxa IV (4a) separated from its plate. All coxal setae of about same length, except (1c), which are simple and shorter, more than ½ as long as (1b). Ventral setae ciliated. Genital region (Fig. 7B) with seven pairs of aggenital setae, each genital flap with six genital setae. Length of genital cover flaps 68, with two pairs of medium size genital papillae. Anal pore terminal, with three pairs of setae, ps3 18 about ½ as long as the ps2, ps1 50, the longest.
Eupodes bakeri n. sp. 5A. — Dorsal idiosoma, female. 5B. — Ventral idiosoma, female. 6A, 6B. — Subcapitulum. 6C. — Palp. 6D. — Tarsus I. 6E. — Tarsus II. 7A. — Male genitalia. 7B. — Female genitalia.
Legs (Fig. 8). — With finely ciliated setae. Leg I longer than body. Femora III and IV distinct divisions. Femur IV somewhat enlarged width 37.

Leg chaetotaxy (adult):

<table>
<thead>
<tr>
<th></th>
<th>Femur</th>
<th>Genu</th>
<th>Tibia</th>
<th>Tarsus</th>
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<td>IV</td>
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Measurements of leg segments:

<table>
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<th>Genu</th>
<th>Tibia</th>
<th>Tarsus</th>
<th>Total</th>
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<td>77</td>
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<td>II</td>
<td>24</td>
<td>81</td>
<td>36</td>
<td>45</td>
<td>48</td>
<td>234</td>
</tr>
<tr>
<td>III</td>
<td>32</td>
<td>72</td>
<td>36</td>
<td>45</td>
<td>63</td>
<td>248</td>
</tr>
<tr>
<td>IV</td>
<td>41</td>
<td>95</td>
<td>59</td>
<td>54</td>
<td>81</td>
<td>330</td>
</tr>
</tbody>
</table>

Length of tarsus I 90, width 15, ratio length to width 6. Length of tarsus II 48, width 15, ratio length to width 3.2. Tarsus I and II (Fig. 6D-E) each with one rhagidial organ with two rhagidial solenidia in tandem and in a common insertion pit. There are apparently no solenidia on any leg segments. Apotele. Claw longer than pad-like empodium.

Male (Fig. 7A). — Length of body 329; width of body 194. Sperm sac length 48, medium sized sac, clavate and about an equal to genital cover flaps, with conspicuous ornamentation, dividing into two-ducks before intering the genital atrium, associated with a complex of ducts and glands inside the latter. Measurements of legs are: I 378; II 243; III 284; IV 266.


Etymology. — The mite is named Dr. A. S. BAKER (The Natural History Museum, London) for her remarkable contribution to the knowledge of eupodid mites.

Genus Cocceupodes Sig Thor, 1934

Cocceupodes sharkiensis n. sp.
(Figs. 9-10)

Affinities: This species is morphologically similar to C. mollicellus, but differs in having threadlike iv setae, roughly triangular peak of naso; c2 shorter than idiosomal dorsal setae; epimeral formula, 3-1-4-3; tarsus II with only two rhagidial organs tandem to each other.

Female (Figs. 9-10). — Length of body 224. Width of body 145. Idiosoma not divided, tapers slightly from shoulders to broadly rounded posteriorly. Subcapitilum, conical, with two pairs of ciliated setae, sbc₂ approximately medial, sbc₁ basilateral, sbc₂ shorter than sbc₁. Palpus setal formula 0-2-3-7, short ciliated setae. Tarsus of palp subequal ⅓ as long as tibia, femorogenu 33, trochanter 13. Ciliated cheliceral seta cha, as in all Cocceupodes, located dorsally just proximal to the fixed digit.

Dorsal idiosoma (Fig. 9 A). — Sejugal furrow absent, as in all Cocceupodes species. Naso, distinct
and roughly triangular peak. Prodorsum subtriangular shaped, two faint broken parallel lines between ev and T setae, with four pairs of ciliated setae: iv threadlike and inserted far from posterior to base of naso, 26 in length; ev seta, broken off; T about 2× as long as iv; sc 18 and 7/5 as long as iv setae. Internal distance of prodorsum: iv-iv, 7 about 1/3 as long that of ev-ev; T-T 55; sc-sc 64. Opisthosoma with eight pairs of short ciliate setae, c₁ 7 very short and about 7/5 as long as h₂, c₂ 40 and about 6× as long as c₁. Other opisthosomal dorsal setae broken off. The distance between bases of opisthosomal setae c₂-c₁ 22, c₁-c₂ 62, 2× as long as c₁-d₁ and e₁-f₁, c₂-c₂ 139, d₁-d₁ equal to d₁-e₁, e₁-e, equal to h₁-h₁, f₁-f₁ 15, f₁-h₁ 35.

Ventral idosoma (Fig. 9 B). — Coxae in two distinct groups. Trochanteral formula 1-1-1-1 setae. Epimeral formula I-IV, 3-1-4 3. Outer seta of coxa I equal to inner seta 1a. Middle seta 1b 18. Genital region with four pairs of short aggenital setae. Each genital flap with four genital setae. Two pairs of genital papillae. Anal pore terminal, with only two pairs of pseudanal setae characteristic of genus. ps₁ absent, ps₃ about 1/3 as long as ps₂.

Legs (Fig. 10). — Leg I longer than body. Femora II partially divided, III and IV with distinct division. Femur IV somewhat enlarged.

**Leg chaetotaxy (adult)**

<table>
<thead>
<tr>
<th>Femur</th>
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<td>3</td>
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<tr>
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**Measurements of leg segments:**

<table>
<thead>
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<th>Troch.</th>
<th>Femur</th>
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<tr>
<td>IV</td>
<td>18</td>
<td>53</td>
<td>31</td>
<td>31</td>
<td>177</td>
</tr>
</tbody>
</table>

Length of tarsus I 26, width 13, ratio length to width 2. Length of tarsus II 33, width 11, ratio length to width 3. Tarsus I (Fig. 10 E) with two rather long subequal rhagidial organs, one behind the other, with a famulus at the proximal end of the basal rhagidial organ. Tarsus II (Fig. 10 F) with two rhagidial organs tandem to each other. Apparently no other sensory setae on legs. Apotele. claw longer than pad-like empodium.


Etymology. — The mite is named for the name of locality (El-Sharkiya region), where it had been observed.

Genus Linopodes Koch, 1835
Linopodes barnufi n. sp.
(Figs. 11-13)

Affinities: This species is similar to L. cameronesis, but can be distinguished from it by setal formula of palpal segments; I-IV, 0-2-3-7 with rhagidial organ, tarsus ½ as long as the femorogenu. leg I is nearly four times as long as the body length. Aggenital region with 6-7 pairs setose setae, pointed apically. Two pairs of pseudanal setae. Tarsus II with three rhagidial organs.

It is of interest to note that the figures and descriptions are based on a single male. External morphology differences between males and females of the eupodid are usually very subtle. Sexual dimorphism is only marked in the genitalia, which are discernible in macerated specimens. Descriptions of other features therefore apply to both sexes. The ratio is almost female biased, although in some rare species, females have not been noted. However, STRANDTMANN (1971), SHIBA (1978) and OLIVIER AND THERON (1997) described the males of Cocceupodes shepardi, Eupodes okinoshimaensis and E. hamatus as a new species, respectively. Thereon, the present study applies these aforementioned note with this rare species.

Male (Figs. 11-12). — Length of body 459, width of body 288. Idiosoma not divided, integument soft, showing dense of fine punctures, ovoid shaped. Subcapitulum cone elongated shaped, with two pairs of ciliated setae, sbc2 approximately medial, sbc1 basilateral, sbc2 shorter than sbc1. Setal formula of slender palpal segments I-II (Fig. 12 c): 0-2-3-7, with rhagidial organ at approximately base of tarsus. Tarsus shorter than tibia and ½ as long as the femorogenu. Fixed digit relatively large, chelicera 117 long, with one short nude seta cha, located dorsally.

Dorsal Idiosoma (Fig. 11 A). — Sejugal furrow represented by two broken parallel in complete faint lines. Naso, distinct and roughly triangular peak. Prodorsum, subtriangular shaped, with internal two fine sinuous lines from behind of each trichobothria, extending forward and surrounding margin of the prodorsum, forming internal subtriangular shaped, with four pairs of ciliated setae: iv inserted on naso and close to posterior margin, 38 in length, ev and sc broken off, T 86 in length. Internal distance of prodorsal setae: iv-iv 14, ev-ev 113, T-T 160, Sc-Sc 185. Opisthosoma with eight of broken setae. The distance between bases of opisthosomal setae: c1-c1 131, c1-c2 81, c2-c2 234, c1-d1 55, d1-d1, equal to F1-h1, d1-e1, equal to e1-F1, c1-c1 44, about equal to F1-F1, h1-h1 40.
Ventral idiosoma (Fig. 11 B). — Coxae in two distinct groups. Trochanteral formula 1-1-1-1 setae. Epimeral formula I IV: 3-1-3-3, pointed apically. Coxae finely punctuated. Genital region (Fig. 12 D) with 6-7 pairs of aggenital setose setae and pointed apically. Genital cover flaps finely punctured, with 6 pairs of short ciliated setae, 4th pair being more lateral in position than the others. Spermat sac 44 mm in length. Two pairs of genital papillae. Anal pore terminal, with only two pairs of pseudanal ciliated setae, pointed apically, ps2 being the longest.

Legs (Fig. 13 B). — All legs longer than body and finely punctured. Leg I extraordinary long, characteristic of genus, and about four times as long as the body length, its tibia being the longest, following femur, genu and tarsus. Empodium and claws of tarsus I small.

Leg chaetotaxy (adult):

<table>
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Measurements of leg segments:

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</tbody>
</table>

Length of tarsus I 293, width 15, ratio of length to width 19.53. Length of tarsus II 189, width 15, ratio of length to width 12.6. Solenidia. Tarsus I (Fig. 12 A) with two rhagidial organs, one behind the other in separate fields, tibia I has a dorsoapical rhagidial organ. Tarsus II (Fig. 12 B) with three rhagidial organs, one behind the other in separate fields, tibia II has a dorsoapical rhagidial organ. There are apparently no sensory setae on the other leg segments. Apotele. Claw longer than pad like empodium, empodium of leg I reduced.

Material examined. - Egypt: Northern Province Holotype ♂, Rasheed, El-Behera, collected from litter and upper soil layer under ploughman’s spikenard (barnuf shrubs), B. A. ABOU-AWAD, 17. XII. 1998.

Etymology. - This mite is named for the name of plant is widely spread in the region, where it had been found.

References


