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A new species of *Erythraeus* (*Erythraeus*) (Acari: Prostigmata: Erythraeidae) from central Kansas

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**ABSTRACT** — A new species of *Erythraeus* from USA, *Erythraeus (Erythraeus)* aphidivorous *n. sp.*, collected as an ectoparasite of the sugarcane aphid, *Melanaphis sacchari*, in central Kansas is illustrated and described. It is the seventh report of *Erythraeus* species having the basifemoral setal formula 2-2-2.

**KEYWORDS** — Parasitengona; taxonomy; ectoparasite; larva

**INTRODUCTION**

Hitherto 42 species of the subgenus *Erythraeus* (*Erythraeus*) have been described based on larval morphology; among them 20 species were described from Europe, 20 from Asia and two from Africa (Khanjani *et al.*, 2007; Beron, 2008; Haitlinger, 2009a, 2009b, 2010, 2011, 2012; Saboori and Çobanoğlu, 2010, Kamran *et al.*, 2011).

To date, only two species of subgenus *Erythraeus*, based on adults, were found in USA: *Erythraeus* (*E.*) *exilipes* Banks, 1947 and *E. (E.*) simplex* Banks, 1915 (Banks, 1915, 1947; Beron, 2008). In this paper we describe the larva of *Erythraeus* (*Erythraeus*) aphidivorus *n. sp.*, which was collected feeding on host aphids *Melanaphis sacchari* (Zehntner) (Hemiptera: Aphididae) from Kansas, U.S.A.

**MATERIALS AND METHODS**

This description is based on two larval specimens collected in Hays, Kansas, USA feeding on host aphids of *Melanaphis sacchari* (Zehntner) (Hemiptera: Aphididae) on 30 June, 2014. Specimens of *M. sacchari* were collected from sorghum plants directly into 70% ethanol and subsequently examined in laboratory for associated mites. Mite specimens were detached from thorax of the host aphid using an insect pin, cleared in Nessbitt’s solution and mounted in Faure medium (Walter and Krantz, 2009). All measurements are given in micrometers (μm) and calculated using a Carl Zeiss Axioscope A1 microscope, and Carl Zeiss Axio Imager A2 with differential interference contrast and phase contrast. The terminology and abbreviations follow Haitlinger (1999, 2013). The holotype and one paratype are deposited at the Museum of Nat-
Figure 1: Erythraeus (Erythraeus) aphisivorus n. sp.: A – Idiosoma dorsal view; B – Scutum.
unequal in diameter anterolaterally, in platelets, an-
soma slightly shorter than others. Two pairs of eyes,
tae (38 in paratype). Setae on posterior part of idio-
soma rounded, dorsal surface with 40 setulose se-

tae nude and 2 setae slightly barbed distally (Figure

Diagnosis — Bfn 2-2-2, ASE 57 – 67, AL 93 – 96, Tal

Material examined — Holotype (larva). Ido-
soma rounded, dorsal surface with 40 setulose se-
tae (38 in paratype). Setae on posterior part of idio-
soma slightly shorter than others. Two pairs of eyes, unequal in diameter anterolaterally, in platelets, an-
terior 19 μm and posterior 17 μm (Figure 1A) in di-
ameter (same in paratype). Dorsal scutum pentag-
onal, 1.4 times wider than long, with two setae AL, distally setulose for one half their length; setae PL shorter, setulose. Anterior border of scutum slightly convex in the middle, posterior border straight (Figure 1B). Sensillary setae ASE distally with very fine setules for one third their length. Sensillary setae ASE short, distally setulose for one quarter their length, located in line between setae AL. ASE < PSE (Figure 1B). Ventral surface of idiosoma with two weakly barbed sternalae 1a (between coxae I), two weakly barbed sternalae 3a (between coxae III) and 16 slightly barbed setae (V) posterior to coxae III (Figure 2A). Sternalae 1b pointed, 3a bifid at the end, both setulose. Coxalae 1b-3b all barbed (Figure 2A); coxalae 1b distinctly longer than coxalae 2b and 3b, 2b < 3b. Coxalae 1b and 3b pointed, coxalae 2b with distal bifid end (Figure 2A). NDV = 40+16 = 56 (in holotype), NDV = 38+16 = 54 (in paratype).

Gnathosoma with smooth galealae (cs), short an-
terior hypostomalae (as1) 10 μm, relatively long (33 μm) and smooth posterior hypostomalae (as2) (Figure 2B).

Palpfemur and palpagnue with one barbed seta each. Palptibia with 5 setae, 2 setae nude and 1 seta weakly barbed (Figure 2B). Palptarsus with 8 setae (eupathidium and solenidion included), 4 setae nude and 2 setae slightly barbed distally (Figure 2C). Metric data are given in Table 1.

Leg setal formula:
Leg I: Ta 1ω, 2ε, 2ε, 25B; Ti 2ρ, 1κ, 14B; Ge 1κ, 1σ, 8B; Tf 5B; Bf 2B; Tr 1B; Cx 1B (Figures 3A-B).
Leg II: Ta 1ω, 2ε, 24B; Ti 2ρ, 15B; Ge 1κ, 8B; Tf 5B; Bf 2B; Tr 1B; Cx 1B (Figures 3C-D).
Leg III: Ta 1ε, 24B; Ti 1ρ, 15B; Ge 8B; Tf 5B; Bf 2B; Tr 1B; Cx 1B (Figures 3E-F).

Etymology — The species was named for its habit of feeding on aphids.

Type material — The holotype and one paratype were collected by J.P. Michaud and Felipe Colares on Melanaphis sacchari (on sorghum), 30 June, 2014, at the Agricultural Research Center-Hays, in Hays, KS (38°51' N lat, 99°20' W long), USA. The holotype and one paratype are deposited in the Museum of Natural History, Podgorica, Montenegro.

Remarks — E. (E.) aphidivoruous n. sp. belongs to the species group with basifemoral formula 2-2-2 (2-2-1). This group includes: E. (E.) adraslus (Southcott, 1961) from Denmark, E. (E.) tinnae Haitlinger, 1997 from Canary Islands, E. (E.) picaforicus Haitlinger, 2002 from Balearic Islands, E. (E.) kacperi Haitlinger, 2004 from Cambodia, E. (E.) yangshounicus Haitlinger, 2006 from China, E. (E.) wallii Kamran, Afzal, Raza, Bashir, Ahmad, 2011 from Pakistan and E. (E.) etnaensis Haitlinger, 2011 from Sicily, Italy (Southcott, 1961; Haitlinger, 1997, 2002, 2004, 2006, 2011, Kamran et al., 2011). It differs from E. (E.) adraslus in the shorter AW (51 – 54 vs. 63 – 77), in the longer Tal (169 – 172 vs. 95), TiI (278 vs. 131), in the number of fV (8 vs. 12), leg I (1056 – 1076 vs. 550) and leg III (1261 – 1267 vs. 680); from E. (E.) tinnae in the longer ASE (57 – 67 vs. 36), in the shorter AW (51 – 54 vs. 80), PW (105 – 108 vs. 144), AL (93 – 96 vs. 140), PL (69 – 71 vs. 104), Tal (169 – 172 vs. 196) and TiIII (401 – 405 vs. 440); from E. (E.) picaforicus in the shorter W (157 – 163 vs. 190), AW (51 – 54 vs. 84), PW (105 – 108 vs. 136), longer TiIII (401 – 405 vs. 362), ISD (77 – 80 vs. 56), and Tal (169 – 172 vs. 156); from E. (E.) kacperi in the longer AL (93 – 96 vs. 74), W (157 – 163 vs. 110), L (117 – 125 vs. 90), GL (162 vs. 140), Tal (169 – 170 vs. 134), TiIII (401 – 405 vs. 280), ISD (77 – 80 vs. 68), fD (38 – 40 vs. 29) and IV (16 vs. 8); from E. (E.) yangshounicus in the shorter DS (53 – 62 vs. 82 – 130), Ta 1ε (46 – 53 vs. 62), PsFd (54 – 58 vs. 575).
**Figure 2:** *Erythraeus (Erythraeus) aphiivorous* n. sp.: A – Idiosoma; ventral view; B – Ventral view (left) and dorsal view of gnathosoma (right); C – Palptarsus.
Figure 3: *Erythraeus (Erythraeus) aphidivorus* n. sp.: A – Leg I, tarsus-tibia; B – Leg I, trochanter-genu; C – Leg II, tarsus-tibia; D – Leg II, trochanter-genu; E – Leg III, tarsus-tibia; F – Leg III, trochanter-genu.
66 – 74), Tal (169 – 172 vs. 192), TIII (401 – 405 vs. 496), in longer L (117 – 125 vs. 104), W (157 – 163 vs. 140), and fD (38 – 40 vs. 56), from *E. (E.) etnaensis* in longer ASE (57 – 67 vs. 38), ISD (77 – 80 vs. 54), L (117 – 125 vs. 108), in shorter AL (93 – 96 vs. 108), DS (53 – 62 vs. 80 – 100), 1a (46 – 53 vs. 80), and 1b (92 – 101 vs. 118), in different NDV (54 – 56 vs. 84), and Tal (1ω, 2ζ, 25B vs. Ta 1ω, 2ζ, 18B) and from *E. (E.) walii* in the longer L (117 – 125 vs. 77 – 83), W (157 – 163 vs. 112 – 120), PW (105 – 108 vs. 50 – 53), ISD (77 – 80 vs. 58 – 63), AP (51 – 56 vs. 45 – 47), AL (93 – 96 vs. 73 – 78) and ASE (57 – 67 vs. 26 – 28).

Tables (2-3) display differences *E. (E.) aphidivoros* sp. nov. in measurements and numbers of setae from all other species of this group.

### Key for the subgenus Erythraeus (Erythraeus) of the world with 2 setae on BFe I-III

1. Ta I < 110, Ti I < 150. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ...
### Table 2: Metric data for world described species (larvae) of subgenus *Erythraeus* (*Erythraeus*).

<table>
<thead>
<tr>
<th>Taxa</th>
<th>L</th>
<th>W</th>
<th>AW</th>
<th>PW</th>
<th>ISD</th>
<th>AL</th>
<th>PL</th>
<th>ASE</th>
<th>FSE</th>
<th>1a</th>
<th>1b</th>
<th>2b</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. (E.)</em> adrastus</td>
<td>100-112</td>
<td>141-167</td>
<td>63-77</td>
<td>105-118</td>
<td>65-70</td>
<td>73-84</td>
<td>55-62</td>
<td>14-24</td>
<td>58-67</td>
<td>89</td>
<td>87</td>
<td>30</td>
</tr>
<tr>
<td><em>E. (E.)</em> tommae</td>
<td>132</td>
<td>194</td>
<td>80</td>
<td>144</td>
<td>76</td>
<td>104</td>
<td>100</td>
<td>36</td>
<td>92</td>
<td>76</td>
<td>128</td>
<td>54</td>
</tr>
<tr>
<td><em>E. (E.)</em> picaforicatus</td>
<td>120</td>
<td>190</td>
<td>84</td>
<td>136</td>
<td>56</td>
<td>84</td>
<td>96</td>
<td>40</td>
<td>90</td>
<td>64</td>
<td>114</td>
<td>53</td>
</tr>
<tr>
<td><em>E. (E.)</em> kauperi</td>
<td>90</td>
<td>110</td>
<td>52</td>
<td>100</td>
<td>68</td>
<td>74</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>88</td>
<td>-</td>
</tr>
<tr>
<td><em>E. (E.)</em> yango-shounicus</td>
<td>104</td>
<td>140</td>
<td>60</td>
<td>112</td>
<td>72</td>
<td>102</td>
<td>62</td>
<td>70</td>
<td>62</td>
<td>108</td>
<td>34</td>
<td>-</td>
</tr>
<tr>
<td><em>E. (E.)</em> vesiilii</td>
<td>77-83</td>
<td>112-120</td>
<td>45-48</td>
<td>74-77</td>
<td>58-63</td>
<td>73-78</td>
<td>50-53</td>
<td>26-28</td>
<td>64-68</td>
<td>50-52</td>
<td>71-76</td>
<td>-</td>
</tr>
<tr>
<td><em>E. (E.)</em> etnaensis</td>
<td>108</td>
<td>150</td>
<td>58</td>
<td>110</td>
<td>54</td>
<td>108</td>
<td>76</td>
<td>38</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>E. (E.)</em> aphidivorous n. sp.</td>
<td>117-125</td>
<td>157-163</td>
<td>51-54</td>
<td>105-108</td>
<td>75-80</td>
<td>93-96</td>
<td>69-71</td>
<td>57-67</td>
<td>80-81</td>
<td>46-53</td>
<td>92-101</td>
<td>36-42</td>
</tr>
</tbody>
</table>

### Table 3: Chaetotaxy of the body and leg segments for world described species (larvae) of subgenus *Erythraeus* (*Erythraeus*).

<table>
<thead>
<tr>
<th>Taxa</th>
<th>BI</th>
<th>Ge I-III</th>
<th>Ta I-III</th>
<th>T I-I-III</th>
<th>F I</th>
<th>F V</th>
<th>NDV</th>
<th>FPP</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. (E.)</em> adrastus</td>
<td>2-2-2</td>
<td>8-8-8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0-B-B-BBB-NNNNN-ωζ</td>
</tr>
<tr>
<td><em>E. (E.)</em> tommae</td>
<td>2-2-2</td>
<td>8-8-8</td>
<td>14-15-14</td>
<td>24-18-22</td>
<td>47</td>
<td>15</td>
<td>62</td>
<td>0-B-B-BBB-NNNNN-ωζ</td>
</tr>
<tr>
<td><em>E. (E.)</em> picaforicatus</td>
<td>2-2-2</td>
<td>8-8-8</td>
<td>11-15-14</td>
<td>22-21-21</td>
<td>72</td>
<td>24</td>
<td>96</td>
<td>0-B-B-BBB-NNNNN-ωζ</td>
</tr>
<tr>
<td><em>E. (E.)</em> kauperi</td>
<td>2-2-1</td>
<td>8-8-8</td>
<td>14-14-14</td>
<td>19-19-18</td>
<td>29</td>
<td>8</td>
<td>37</td>
<td>0-B-B-BBB-NNNNN-ωζ</td>
</tr>
<tr>
<td><em>E. (E.)</em> yango-shounicus</td>
<td>2-2-1</td>
<td>8-8-8</td>
<td>14-15-15</td>
<td>22-20-5</td>
<td>56</td>
<td>14</td>
<td>70</td>
<td>0-B-B-BBB-NNNNN-ωζ</td>
</tr>
<tr>
<td><em>E. (E.)</em> vesiilii</td>
<td>2-2-2</td>
<td>8-8-7</td>
<td>14-15-14</td>
<td>21-15-18</td>
<td>32</td>
<td>10</td>
<td>42</td>
<td>0-B-B-BN-NNNNN-ωζ</td>
</tr>
<tr>
<td><em>E. (E.)</em> etnaensis</td>
<td>2-2-2</td>
<td>8-8-8</td>
<td>14-15-14</td>
<td>18-16-18</td>
<td>64</td>
<td>20</td>
<td>84</td>
<td>0-B-B-B-NNNN-ωζ</td>
</tr>
<tr>
<td><em>E. (E.)</em> aphidivorous n. sp.</td>
<td>2-2-2</td>
<td>8-8-8</td>
<td>14-15-15</td>
<td>25-24-24</td>
<td>80-40</td>
<td>16</td>
<td>54-56</td>
<td>0-B-B-BN-NNNNN-ωζ</td>
</tr>
</tbody>
</table>

(7) *E. (E.)* yango-shounicus TaI broken.
(?) *E. (E.)* etnaensis palpntarsus slightly visible.

6. W > 180, PW > 130.................*E. (E.)* picaforicatus
Haitlinger, 2002; Balearic Islands
— W < 170, PW < 120 .........................7
7. Ti III < 430 ..............................8
— Ti III > 450 .............................*E. (E.)* yango-shounicus
Haitlinger, 2006; China
8. DS > 70, ISD < 70, FID > 45  ........ ..........*E. (E.)* etnaensis Haitlinger, 2011; Sicily
— DS < 70, ISD > 70, FID < 45  ..................*E. (E.)* aphidivorous n. sp. ; U.S.A.

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