Erythraeid mites (Prostigmata, Erythraeidae) from Saudi Arabia, description of three new species and a new record

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Abstract

Three erythraeid genera Balaustium von Heyden, Charletonia Oudemans, and Erythraeus Latreille (Trombidiformes: Prostigmata) are reported for first time from Saudi Arabia based on three new larval species, B. yousifi sp. n., C. bahaensis sp. n., and E. (Erythraeus) uhadi sp. n. and one new record Erythraeus (Zaracarus) lancifer Southcott. All the three new species are described and illustrated from larvae.

Keywords

Balaustium, Charletonia, Erythraeus, Riyadh

Introduction

Mites of the family Erythraeidae (Trombidiformes: Prostigmata) are generally predators at postlarval stages, feeding upon various arthropods. However larvae of most erythraeids are parasites of different arthropods including insects e.g. bugs, grasshoppers, flies, aphids, etc. (Southcott 1961, 1991; Goldarazena et al. 2000; Gerson et al. 2003; Saboori and Cobanoglu 2010).

The genus Erythraeus Latreille comprises two subgenera, Erythraeus Latreille, 1806 and Zaracarus Southcott, 1995. The subgenus Erythraeus includes 93 species. Among
these, 45 species are known from larvae (Khanjani et al. 2012; Mąkol and Wohltmann 2012, 2013). The subgenus *Zaracarus* includes 27 species that all have been described from larvae (Mąkol and Wohltmann 2012, 2013). More than 50% of all larval species of subgenus *Erythraeus* have been recorded as parasites on Heteroptera, Thysanoptera, Neuroptera and other insects whereas others were captured free living on herbaceous plants (Haitlinger 2012; Khanjani et al. 2010, 2012; Kamran et al. 2013; Stroiński et al. 2013).

The genus *Charletonia* Oudemans comprises 117 species: two species described from both larval and post larval stages; 92 species described only from larvae, and 23 species known only from post larval stages (Haitlinger 2007, Beron 2008; Mąkol and Wohltmann 2012, 2013). Most larval species of this genus were recorded as parasites on Orthoptera and Heteroptera (Haitlinger 2004a; Mayoral and Barranco 2011; Saboori et al. 2012; Haitlinger et al. 2014), however some larval species were recorded free living on herbaceous plants (Haitlinger 2004a, b; Hakimitabar and Saboori 2011). The free living larvae might be collected at early larval period while searching different hosts on herbaceous plants.

The genus *Balaustium* von Heyden widespread in the world, comprises 36 nominal species: 5 species described from both larval and post-larval stages, 17 described only from post larval stages, and 14 species based only on larvae (Mąkol et al. 2012; Mąkol and Wohltmann 2012). Larvae of *Balaustium* were generally collected from plants (Mayoral and Barranco 2009; Mąkol et al. 2012). Only *B. wratislaviensis* Haitlinger, 1996 was collected from different vertebrates species (Passeriformes: Pardaeae) (Haitlinger 1996). Family Erythraeidae is very poorly known in Saudi Arabia. Previously only *Leptus tammuzi* Haitlinger, 1994 was reported from this country (Haitlinger 1994). In this study, three genera, *Balaustium*, *Charletonia* and *Erythraeus* are reported for the first time from Saudi Arabia with three new species viz. *B. yousifi* sp. n., *C. bahaensis* sp. n. and *E. (E.) uhadi* sp. n. and one new record *E. (Z.) lancifer* Southcott.

**Materials and methods**

Three regions of Saudi Arabia, Al-Riyadh, Al-Madina and Baha, were surveyed for the collection of erythraeid mites during the years 2012-2013. Two collection methods were used: i) different plant parts were shaken over pieces of white paper and the mites were transferred using camel hair brush into 70% alcohol; ii) Tullgren funnels were used to extract mites from plant material brought to the laboratory. Mites parasitic on different insects were collected and preserved along with their hosts. Later, the mites were detached from their hosts under the stereomicroscope (Olympus®, SZX10, Japan). The collected mite specimens were cleared in Nesbitt’s fluid for 10–12 h. Subsequently, the specimens were mounted on slides in Hoyer’s medium, and dried in oven at 40 °C for one week. The mounted specimens were examined under a phase-contrast microscope (DM2500, Leica®, Germany). Template illustrations were either drawn
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with pencil by using a drawing tube (Olympus®, Japan) attached to the microscope, or different body parts of mites were pictured with an Auto-montage Software System (SYNCROSCOPY®, Cambridge, UK) attached to the microscope. Final processing of drawings was done in Adobe Illustrator (Adobe Systems Incorporated, USA). The terminology used in this study follows that of Haitlinger and Saboori (1996). All measurements are given in micrometers. The measurements in description refer to the holotype followed by as a range of paratypes in parenthesis.

Results and discussion

Family Erythraeidae Robineau-Desvoidy
Subfamily Erythraeinae Robineau-Desvoidy

Genus *Erythraeus* Latreille

Type species. *Acarus phalangoides* (de Geer), by original designation.

*Erythraeus (Erythraeus) uhadi* sp. n.
http://zoobank.org/D69C9E7F-7869-4556-9ABE-8485E7F66DEF
Figs 1–13

**Diagnosis** (n=6). fn Bfe 3-3-3, IP 2519–2597, fnTi 14-15-15, fD 32, fV 10, AL 90-97, AP 32–35, PSE 80–87, Ti III 279-289, Ti II 180-196, Genu III 143-149.

**Description.** (Holotype larva):

Dorsum: Prodorsal scutum with two pairs of sensilla (ASE and PSE) and two pairs of setae (AL and PL). AL located slightly anterior to ASE bases, PSE present at posterior pole of scutum, Posterior pair of sensilla (PSE) more than three times longer than anterior pair ASE, both finely ciliated on their distal halves. Cuticular lines surround both sensilla. AL longer than PL, both with long dense barbs on their entire lengths. Prodorsal scutum almost pentagonal in shape, straight anteriorly, round posteriorly, widest at the level of PL setae (Fig 3). Two pairs of eyes present at the level of posterior end of scutum dorsolaterally on idiosoma, anterior pair 24 (22–24) across, posterior pair 14 (13–14) across. Dorsal setae on idiosoma, 16 pairs (fD = 32), barbed and ranging in lengths from 29–61 (28–64)(Fig. 1).

Venter: Idiosoma ventrally bears setae 1a between coxae I, setae 3a slightly anterior to the area between coxae III; 1a 50 (48-54), 3a 28 (28–32) long; opisthogaster behind the coxae III with 10 setae (fV=10). All ventral setae with dense barbs. NDV = 32+10 = 42 (Fig. 1B). Coxae I-III each with one coxalae; all coxalae barbed. Coxalae 1b three times longer than 2b (Fig. 2).

Gnathosoma: Infra-capitulum with one pair of nude hypostomal setae (*Hy*) 30 (30–34) and nude galealae (*Ga*) 23 (21-24), supracoaxalae present, very small, peg-like.
Palp five segmented, palpfemur and genu each with one barbed seta, palptibia with three barbed setae, tibial claw bifurcate. Palptarsus with one eupathidium, one solenidion, two smooth and four barbed setae including one long seta (Figs 4, 4a). Palp setal formula: fPp: 0-B-B-BBB<sup>2</sup>- NNBBBB<sup>ζω</sup>.

Legs: Legs seven segmented with divided femora, all legs longer than body length; leg III the longest one, Tarsi terminate into two lateral claws and a claw like empodium. Chaetotaxy of leg segments: coxae 1-1-1; trochanters 1-1-1; basifemora 3-3-3;
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telofemora 5-5-5; genua 8+1σ+1κ − 8+1κ − 8; tibiae 14 + 2φ + 1Cp + 1κ − 15 + 2φ − 15+1φ; tarsi 22 + 1ω + 1ε + 1Cp + 2ζ − 20 + 1ω + 1Cp + 2ζ − 20 + 1ζ (Figs 5–13).

**Etymology.** The specific epithet is derived from the name of famous mountain "Uhad", where holotype larva was collected.

**Type material.** Holotype larva was collected from the mountain “Uhad”, Al-Madina, Saudi Arabia, 24°30.086’N, 39°36.41’E, on 23 February, 2013, coll. M. Kamran), parasitizing tamarix leafhopper, *Opseius* sp. (Hemiptera: Cicadellidae), from *Tamarix* sp. (Tamaricaceae). Paratypes 4 larvae, collection data same as holotype, while one paratype was collected from Wadi-e-Hanifa near Arqa over bridge, Riyadh, Saudi Arabia, 24°41.354’N, 46°37.042’E, on 14 April, 2013, from *Tamarix* sp. in association with the same host, coll. M. Kamran. Holotype and 4 paratypes (P2, P3, P4, P5) are deposited in the King Saud University Museum of Arthropods (KSMA) and Acarology Laboratory, Department of Plant Protection, College of Food and Agriculture Sciences, King Saud University. One paratype (P1- accession no. Acy: 14/47) has been deposited at the Agriculture Research Council, Plant Protection Research Institute, Biosystematics Division, Pretoria (ARC-PPRI), South Africa.

**Remarks.** *Erythraeus (E.) uhadi* sp. n. belongs to a group of species of subgenus *Erythraeus* that share the following combination of characters: basifemoral setal

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*Figures 5–7. Erythraeus (Erythraeus) uhadi* sp. n., (Larva): 5 Trochanter, femur & genu I 6 Trochanter, femur & genu II 7 Trochanter, femur & genu III.
Figures 8–13. *Erythraeus* (*Erythraeus*) *uhadi* sp. n., (Larva): 8 Tibia I 9 Tibia II 10 Tibia III 11 Tarsus I 12 Tarsus II 13 Tarsus III.
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This group includes 7 species: *E. (E.) flavopictus* Kawashima, 1961; *E. (E.) sabrinae* Haitlinger & Saboori, 1996; *E. (E.) southcotti* Goldarazena & Zhang, 1998; *E. (E.) ankaraicus* Saboori et al., 2004; *E. (E.) zhangi* Haitlinger, 2006; *E. (E.) hilarae* Haitlinger, 2010, *E. (E.) chrysoperlae* Khanjani et al., 2012 (Kawashima 1961; Haitlinger and Saboori 1996; Goldarazena and Zhang 1998; Saboori et al. 2004; Haitlinger 2006a, 2010; Khanjani et al. 2012). *Erythraeus (E.) uhadi* sp. n. differs from *E. (E.) flavopictus* by shorter ASE (22-25 vs. 55), shorter W (99-108 vs. 153), shorter IP (2519-2597 vs. 2944), shorter AP (32-35 vs. 59), fD (32 vs. 42); from *E. (E.) sabrinae* by shorter AP (32-35 vs. 52), fD (32 vs. 62), fV (10 vs. 28), shorter W (99-105 vs. 132), shorter AW (44-47 vs. 60), shorter PW (81-85 vs. 110); from *E. (E.) southcotti* by shorter AP (32-35 vs. 48-50), longer PaScGed (50-54 vs. 25-30), fD (32 vs. 46), fV (10 vs. 16), fnTa (21-20-20 vs. 26-23-24); from *E. (E.) zhangi* by shorter L (69-81 vs. 96-128), shorter W (99-108 vs. 126-148), shorter GL (106-111 vs. 140-166), shorter IP (2519-2597 vs. 2622-3198), fD (32 vs. 86), fV (10 vs. 20); *E. (E.) ankaraicus* by fnTa (21-20-20 vs 25-22-24), fD (32 vs. 41), fV (10 vs. 18), AL (90-97 vs. 65-78), AP (32-35 vs. 41-48); from *E. (E.) hilarae* by shorter L (69-81 vs. 110), shorter W (99-108 vs. 128), shorter ISD (49-53 vs. 68), shorter GL (106-111 vs. 130), fV (10 vs. 16), fnTi (14-15-15 vs. 14-14-14) and from *E. (E.) chrysoperlae* by fV (10 vs. 14), fnTa (21-20-20 vs. 27-23-24), longer AL (90-97 vs. 70), shorter AP (32-35 vs. 50), shorter GL (106-111 vs. 150).

**Table 1.** Metric data of *Erythraeus (E.) uhadi* sp. n. larva (holotype and 5 paratypes).

| Ch. | H   | P1  | P2  | P3  | P4  | P5  | Ch. | H   | P-1 | P2  | P3  | P4  | P5  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| IL  | 302 | 300 | 305 | 307 | 298 | 297 | Ta I(H)| 16  | 15  | 16  | 15  | 16  | 16  | 16  |
| IW  | 195 | 197 | 195 | 200 | 194 | 199 | Ti I  | 205 | 206 | 205 | 210 | 211 | 207 |
| L   | 71  | 73  | 70  | 74  | 69  | 81  | Ge I  | 185 | 183 | 185 | 190 | 193 | 186 |
| W   | 105 | 103 | 102 | 108 | 106 | 99  | Tfe I | 113 | 111 | 115 | 112 | 116 | 110 |
| AW  | 44  | 45  | 44  | 48  | 46  | 47  | Bfe I | 105 | 106 | 103 | 107 | 110 | 104 |
| PW  | 81  | 83  | 82  | 85  | 81  | 85  | Tr I  | 44  | 45  | 46  | 43  | 47  | 44  |
| AA  | 11  | 11  | 11  | 12  | 11  | 12  | Cx I  | 35  | 34  | 36  | 34  | 36  | 35  |
| SB  | 13  | 13  | 13  | 14  | 13  | 14  | Leg I | 829 | 828 | 834 | 843 | 853 | 826 |
| ISD | 50  | 52  | 49  | 53  | 53  | 51  | Ta II(L)| 136 | 138 | 135 | 139 | 141 | 134 |
| AP  | 34  | 33  | 35  | 35  | 32  | 35  | Tall(H)| 15  | 15  | 15  | 14  | 15  | 15  |
| AL  | 92  | 90  | 93  | 97  | 91  | 95  | Ti II | 189 | 187 | 189 | 180 | 196 | 192 |
| PL  | 63  | 61  | 62  | 60  | 65  | 60  | Ge II | 126 | 127 | 129 | 124 | 131 | 122 |
| ASE | 23  | 24  | 25  | 22  | 23  | 22  | Tfe II| 110 | 108 | 113 | 107 | 113 | 110 |
| PSE | 81  | 80  | 82  | 87  | 81  | 84  | Bfe II| 95  | 97  | 96  | 98  | 94  | 94  |
| DS  | 29–61 | 29–62 | 28–61 | 30–64 | 30–63 | 29–62 | Tr II | 50  | 52  | 50  | 48  | 54  | 53  |
| PDS | 29–61 | 29–62 | 29–61 | 29–64 | 29–63 | 29–62 | Cx II | 63  | 65  | 63  | 60  | 61  | 61  |
| 1a  | 50  | 52  | 53  | 54  | 48  | 50  | Leg II| 769 | 774 | 775 | 756 | 790 | 766 |
Subgenus Zaracarus Southcott

Erythraeus (Zaracarus) lancifer Southcott

Erythraeus (Z.) lancifer Southcott, 1995: 223.

Material examined. Six larvae, Baha, Saudi Arabia, 20°7.918’N, 41°24’69’E on 24 April, 2013, coll. M. Kamran, parasitizing tamarix leafhopper, Opseius sp. (Hemiptera: Cicadellidae); two larvae were collected as free living on Setaria viridis L. (Poaceae) from the same locality and date.

Remarks. The type specimens were collected from a fly (Diptera, Dolichopodidae) Nr Pina, Zaragoza Province, Spain (Southcott 1995). This species has been hitherto only recorded from Spain. Present samples constitute a new record for Asia.

Table 2. Metric data of Erythraeus (Z.) lancifer larva (measurements of 4 specimens in range).

| Ch. | H  | P1  | P2  | P3  | P4  | P5  | Ch. | H  | P-1 | P2  | P3  | P4  | P5  |
|-----|----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|
| 3a  | 28 | 29  | 28  | 30  | 30  | TaIII (L) | 154 | 152 | 156 | 150 | 157 | 153 |
| 1b  | 100| 99  | 102 | 105 | 100 | TaIII(H) | 15  | 15  | 15  | 14  | 15  | 15  |
| 2b  | 33 | 32  | 30  | 35  | 32  | 34  | Ti III | 286 | 287 | 279 | 287 | 289 | 283 |
| 3b  | 38 | 37  | 36  | 40  | 39  | 38  | Ge III | 148 | 149 | 146 | 144 | 143 | 144 |
| Hy  | 30 | 31  | 30  | 34  | 32  | 30  | Tfe  | 113 | 114 | 110 | 112 | 116 | 113 |
| Ga  | 23 | 22  | 21  | 24  | 23  | 22  | Bfe  | 123 | 123 | 125 | 126 | 128 | 122 |
| G L | 107| 110 | 108 | 111 | 106 | 107 | Tr III | 50  | 53  | 52  | 50  | 53  | 51  |
| PaScFed | 50 | 52  | 51  | 54  | 51  | 49  | Cx III | 66  | 67  | 65  | 66  | 68  | 67  |
| PaScGed | 52 | 54  | 52  | 56  | 50  | 53  | LegIII | 940 | 945 | 933 | 937 | 962 | 933 |
| Ta I(L) | 142| 143 | 144 | 147 | 140 | 140 | IP  | 2538| 2547| 2542| 2519| 2597| 2525|

Ch = Character, H = Holotype, P = Paratype
Subfamily Callidosomatinae Southcott
Genus Charletonia Oudemans

Charletonia bahaensis sp. n.
http://zoobank.org/BEBA76A2-2E8F-4102-8BAD-714C99FE6F2A
Figs 14–23

Diagnosis (n=7). fnTi 18-18-18, fD 121-123, fV 60-61, with two hypostomalae, posterior hypostomalae barbed, galeala nude, GL 157-164, fnGe 12-12-12, four setae between coxae II & III, solenidion on genu I located distally.

Description of holotype larva. (Metric data of holotype followed by as a range of six paratypes in parenthesis).

Dorsum: Prodorsal scutum punctate entirely, with two pairs of sensillae (ASE, PSE) and three pairs of normal setae (AL, PL, PL). Posterior sensilla (PSE) longer than anterior ones (ASE), both finely barbed at distal halves. All three scutalae AL, ML and PL densely barbed and blunt ended, (Fig 16). Dorsum with 123 (121–123) barbed setae (fD = 123 (121–123) with blunt tips, ranging in lengths from 45 (42–56). A pair of eyes located laterally on idiosoma posterolateral to scutum, 21 (21–23) across (Fig. 14).

Venter: Venter with intercoxal setae (1a) between coxae I, one pair of intercoxal setae (2a) between coxae II, four setae in the area between coxae II & III, 57 (56–57) setae present on opisthogaster behind the coxae III (fV = 61 (60–61). All ventral setae barbed with pointed tips except postero-marginal setae on venter which are blunt-ended (Fig. 15).

Gnathosoma: Subcapitulum with one pair of nude, spiniform galealae (Ga) 33 (30–34), two pairs of hypostomalae, anterior pair (aHy) nude, 16 (15–17), posterior pair (pHy) with long barbs, 45 (42–47). Chelicerae 114 (113–116), cheliceral blade 19 (18–19). Supracoxalae present, very small, peg-like. Palpfemur and genu each with one barbed seta, palptibia with three barbed setae and bifurcated claw (Fig. 17), palptarsus with one eupathidium, one solenidion, one nude and four barbed setae including long basal seta (Fig. 17A), eupathidium 25 (23–25), solenidion 7 (6–7) and long basal seta, 39 (35–40) long. Palp setal formula: 0-B-B-BBB2 –4BNωζ.

Legs: Legs seven segmented with divided femora, all longer than body length. Tarsi I–III terminate in two lateral claws and claw like empodium.

Leg setal formula: Cx: 1-2-2; Tr: 1-1-1; Bfe: 4-4-2; Tfe: 5-5-5; Ge: 12+1σ+1κ – 12+ 1κ – 12; Ti: 18+2φ + 1Cp+ 1κ – 18+ 2φ –18 + 1φ; Ta: 27+ 1ω + 1ε + 1Cp + 2ζ – 26 + 1ω + 1ζ – 27 + 1ζ (Figs 18–23).

Etymology. The specific epithet is derived from the city name “Baha” (in Saudi Arabia) where it was collected.

Type material. Holotype and 6 paratype larvae, from blue alfalfa aphid, Acyrthosiphon kondoi Shinji (Hemiptera: Aphididae), infesting alfalfa plants, Medicago sativa L., Baha, Saudi Arabia, 19°59.807’N, 41°25.715’E, on 25 April, 2013, coll. M. Kamran. Holotype and 5 paratypes (P2, P3, P4, P5, P6) are deposited in the King Saud
University Museum of Arthropods (KSMA) and Acarology Laboratory, Department of Plant Protection, College of Food and Agriculture Sciences, King Saud University. One paratype (P1- accession no. Acy: 14/46) has been deposited at the Agriculture Research Council, Plant Protection Research Institute, Biosystematics Division, Pretoria (ARC-PPRI), South Africa.

Remarks. *Charletonia bahaensis* sp. n. belongs to the species group of genus *Charletonia* with four setae between coxae II & III, solenidion placed distally on genu I, fn
Erythraeid mites (Prostigmata, Erythraeidae) from Saudi Arabia...

this group includes 11 species: *C. areolata* (Trägårdh, 1908); *C. froggatti* Oudemans, 1910; *C. feideri* Southcott, 1966; *C. rageaui* Southcott, 1966; *C. paolii* Southcott, 1966; *C. banksi* Southcott, 1966; *C. enghoffi* Southcott, 1991; *C. hunanensis* Zheng, 1996; *C. lombokensis* Haitlinger, 2006; *C. grandpopensis* Haitlinger, 2007 and *C. salazari* Mayoral & Barranco, 2011 (Southcott 1966, Southcott 1991, Zheng 1996, Haitlinger 2006b, 2007, Mayoral and Barranco 2011). The new species differs from *C. areolata* by fD (121-123 vs. 97), fV (60-61 vs. 42), setae on Ti III (18 vs. 19), Ti III (231-242 vs. 259), Ti I (175-183 vs. 199), Ge I

Figures 18–20. *Charletonia bahaensis* sp. n. (Larva): 18 Trochanter, femur & genu I 19 Tibia & Tarsus I 20 Trochanter, femur & genu II.
Figures 21–23. Charletonia bahaensis sp. n. (Larva): 21 Tibia & Tarsus II 22 Trochanter, femur & genu III 23 Tibia & Tarsus III.

(127-135 vs. 157), Galealae (nude vs. ciliated); from C. froggatti by fD (123 vs. 64), fV (60-61 vs. 37), fnTi (18-18-18 vs. 14-14-18); from C. feideri by fD (121-123 vs. 86), fV (61 vs. 44), setae on Ti III (18 vs. 19), Ti I (173-184 vs. 138-159), Ge III (140-148 vs. 121), Ge I (127-135 vs. 112-125), Ta I (158-166 vs. 129-140); from C. rageaui by fD (121-123 vs. 94), fV (61 vs. 54), fnTi (18-18-18 vs. 18-18-19), Ta I (158-166 vs. 142-149); from C. paolii by fD (121-123 vs. 98), setae on Ti III 18 vs. 19), posterior hypostomalae (barbed vs. nude), W (114-118 vs. 98), PL (49-55 vs. 36-43), Ta I (158-166 vs. 137), galealae (nude vs. barbed), Ta III (165-177 vs. 133); from C. banksi by fD (121-123 vs. 97), fV (60-61 vs. 46), setae on Ti III (18 vs. 19), Ge III (140-148 vs. 138-159).
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vs. 125), galealae (nude vs. barbed), leg I (741-781 vs. 725), leg II (694-716 vs. 660), leg III (869-911 vs. 790); from C. enghoffi by fD (121-123 vs. 52), fV (60-61 vs. 40), setae on Ti I (18 vs. 17), posterior hypostomalae (barbed vs. nude), PSE (87-95 vs. 116-129), ASE (48-51 vs. 70-75); C. hunanensis by fD (121-123 vs. 73), fV (60-61 vs. 47), setae on Ti II (18 vs. 21), Ge III (140-148 vs. 125), setae on Tfe (5 vs. 6); from C. lombokensis by fD (121-123 vs. 74), fV (60-61 vs. 40), setae on Ti II (18 vs. 17), fnBfe (4-4-2 vs. 3-3-2), PW (106-113 vs. 50), ASE (48-54 vs. 22), PSE (87-95 vs. 36); from C. grandpopensis by fD (121-123 vs. 60), fV (60-61 vs. 43), setae on Ti III (18 vs. 17), ASE (ciliated vs. nude), DS (42-56 vs. 68-72), Ta I (158-166 vs. 130-134), GL (155-164 vs. 96-108), galealae (nude vs. barbed); from C. salazari by fD (121-123 vs. 76), fV (60-61 vs. 28), fnTi (18-18-18 vs. 15-16-16), ISD (71-78 vs. 54-63), AL (50-56 vs. 67-72), AP (48-52 vs. 68-72). In brief the new species can be differentiated from all other species of this group by having fD 123, fV 61 and fn Ti 18-18-18. All other species of this group have dorsal setae less than 100.

### Table 3. Metric data of Charletonia bahaensis sp. n. larva, holotype and 6 paratypes (in range).

| Ch. | H | P1 | P2 | P3 | P4 | P5 | P6 | Ch. | H | P1 | P2 | P3 | P4 | P5 | P6 |
|-----|---|----|----|----|----|----|----|-----|---|----|----|----|----|----|----|
| IL  | 441| 436| 439| 435| 430| 442| 441| PaScFed | 58 | 55 | 57 | 58 | 57 | 55 | 59 |
| IW  | 280| 285| 275| 272| 276| 278| 282| PaScGev | 32 | 30 | 29 | 33 | 29 | 33 |
| L   | 110| 112| 109| 108| 110| 116| 117| Ta I(L) | 164| 160| 158| 166| 165| 159| 165 |
| W   | 116| 117| 118| 114| 116| 115| 117| Ta I(H) | 16 | 15 | 17 | 16 | 16 | 16 | 17 |
| AW  | 84 | 81 | 86 | 81 | 86 | 84 | 85 | Ti I   | 181| 180| 178| 183| 175| 173| 184 |
| MW  | 98 | 94 | 100| 97 | 101| 93 | 98 | Ge I   | 132| 133| 127| 135| 130| 129| 135 |
| PW  | 110| 112| 109| 108| 112| 113| 106| Tfe I  | 88 | 85 | 89 | 90 | 90 | 86 | 91 |
| AA  | 10 | 10 | 11 | 11 | 10 | 10 | 10 | Bfe I  | 88 | 86 | 89 | 90 | 85 | 84 | 91 |
| SB  | 20 | 19 | 20 | 19 | 21 | 18 | 18 | Tr I   | 47 | 49 | 46 | 47 | 46 | 46 | 47 |
| ISD | 75 | 71 | 78 | 72 | 77 | 75 | 71 | Cx I   | 66 | 65 | 67 | 63 | 64 | 68 |
| AP  | 49 | 50 | 52 | 47 | 50 | 48 | 49 | Leg I  | 766| 758| 754| 778| 754| 741| 781 |
| AL  | 54 | 52 | 51 | 50 | 54 | 55 | 56 | Ta II(L)| 152| 146| 150| 154| 154| 150| 155 |
| ML  | 54 | 55 | 52 | 53 | 57 | 57 | 58 | Ta II(H)| 15 | 15 | 16 | 15 | 16 | 15 | 16 |
| PL  | 52 | 51 | 49 | 50 | 55 | 53 | 53 | Ti II  | 156| 159| 153| 153| 151| 150| 155 |
| ASE | 49 | 50 | 51 | 48 | 54 | 50 | 49 | Ge II  | 113| 111| 110| 114| 115| 110| 116 |
| PSE | 93 | 91 | 90 | 87 | 95 | 89 | 95 | Tfe II | 78 | 85 | 77 | 80 | 75 | 76 | 81 |
| DS  | 45-54| 44-55| 43-54| 42-53| 45-55| 44-54| 45-56| Bfe II | 79 | 79 | 80 | 82 | 77 | 80 | 83 |
| PDS | 45-54| 44-55| 43-54| 42-53| 45-55| 44-54| 45-56| Tr II  | 59 | 60 | 62 | 58 | 56 | 57 | 61 |
| 1a  | 44 | 44 | 42 | 40 | 45 | 44 | 46 | Cx II  | 74 | 71 | 73 | 75 | 70 | 71 | 74 |
| 2a1 | 57 | 55 | 54 | 54 | 60 | 58 | 59 | Leg II | 711| 710| 705| 716| 698| 694| 725 |
| 1b  | 71 | 69 | 68 | 67 | 73 | 73 | 72 | Ta III (L)| 172| 170| 166| 177| 165| 168| 175 |
| 2b1 | 71 | 69 | 67 | 78 | 77 | 73 | 73 | Ta III (H)| 16 | 15 | 16 | 15 | 15 | 15 | 16 |
| 2b2 | 55 | 53 | 56 | 52 | 56 | 57 | 54 | Ti III | 237| 239| 233| 231| 242| 230| 241 |
| 3b1 | 55 | 52 | 57 | 52 | 57 | 56 | 53 | Ge III | 146| 144| 148| 148| 140| 141| 147 |
| 3b2 | 46 | 44 | 47 | 42 | 48 | 45 | 42 | Tfe   | 113| 111| 115| 109| 112| 110| 115 |
| GL  | 161| 158| 163| 155| 164| 159| 157| Bfe   | 89 | 88 | 90 | 87 | 90 | 87 | 90 |
| pHy | 45 | 44 | 42 | 43 | 47 | 46 | 47 | Tfe   | 113| 111| 115| 109| 112| 110| 115 |
| aHy | 16 | 17 | 16 | 16 | 17 | 15 | 15 | Cx III| 80 | 81 | 78 | 77 | 80 | 77 | 83 |
| Ga  | 33 | 34 | 32 | 31 | 34 | 33 | 30 | LegIII| 895| 893| 886| 887| 903| 869| 911 |
| IP  | 2372| 2361| 2345| 2381| 2355| 2304| 2417|
Subfamily Balaustiinae Grandjean
Genus Balaustium von Heyden

*Balaustium yousifi* sp. n.
http://zoobank.org/71EF1ABE-54D9-430E-9D44-40E5E1A3B5F1
Figs 24–29

**Diagnosis** (n=7). Scutum present, three pairs of scutalae present off the scutum, fnTr 3-3-2, fnBfe 4-4-3, fnTi 11-11-11, PSE 66-75, IP 1294-1363, ISD 65-69, fV 60 and fD 74.

**Description of holotype larva.** Dorsum: Idiosoma oval in shape, scutum elongate, 92 (88–95) long, 23 (21–25) wide, carries two pairs of sensilla (ASE & PSE), ASE located on anterior while PSE on posterior part of scutum, both sensilla finely barbed on their entire lengths. Crista present on scutum. Three pairs of scutalae (AL, ML, PL) present on the lateral sides of scutum, no scutalae located on scutum. AL located slightly posterior to the bases of ASE, ML lies slightly anterior to the middle of scutum and PL slightly posterior to the middle of scutum. One pair of eyes present on postero-lateral

**Figures 24–26. Balaustium yousifi** sp. n. (Larva): 24 Dorsum 25 Venter 25A dorsal scutum 26 Gnathosoma (left dorsal view, right ventral view) 26A Palptarsus, 26B Palptibia.
Erythraeid mites (Prostigmata, Erythraeidae) from Saudi Arabia...

Side of scutum at the level of PSE on the idiosoma, cornea of each eye 14 (13–14) in diameter. Dorsal setae on idiosoma 37 pairs, all barbed. $fD = 74$ (Fig. 24).

Venter: Idiosoma ventrally with one pair of sternalae $1a$ between coxae I, 56 (52–57) long, one pair of setae $2a$ between coxae II, 42 (41–47) long, 26 setae present in the area between coxae II & III, 60 (59–60) setae present between and behind the coxae III ($fV = 86$ (84–86). All ventral setae barbed (Fig. 25).

Gnathosoma: Gnathosoma with one pair of hypostomalae ($Hy$) 16 (15–17) and one pair of galealae ($Ga$) 10 (9–10), both barbed, supracoxalae present, very small, peg-like. Chelicerae 52–55 long, cheliceral blade 9 (9–10). Palp trochanter and palp femur each with one barbed setae, palp genu with two barbed setae (Fig. 26); palptibia with three setae, palptarsus with four nude setae, one eupathidium and one solenidion (Fig. 26A). Palptibial claw entire with a median tooth (Fig. 26B). Eupathidium 7 (7), solenidion 16 (14–16). (Fig. 26). Palp setal formula: $fPp: B-B-BB- BBN- NNNN\omega\zeta$.

Legs: Legs seven segmented with divided femora, tarsi I–III terminated with two claws and claw-like empodium, empodium with pilose (pulvilliform) structure. Leg setal formula: leg I: $Ta-\omega, 2\zeta, 1\ Cp, 22\ B; Ti- 2\varphi, 1\kappa, 11\ B; Ge- 1\sigma, 1\kappa, 9\ B ; Tfe - 5\ B$;

Figures 27–29. *Balaustium yousifi* sp. n. (Larva): 27 Leg I 28 Leg II 29 Leg III.
Table 4. Metric data of *Balaustium yousifi* sp. n. larva (holotype and 6 paratypes).

| Ch. | H  | P-1 | P2 | P3 | P4 | P5 | P6 | Ch. | H  | P1 | P2 | P3 | P4 | P5 | P6 |
|-----|----|-----|----|----|----|----|----|-----|----|----|----|----|----|----|----|
| IL  | 471| 478 | 466| 475| 459| 465| 460| Ta (H) | 23 | 22 | 22 | 22 | 22 | 23 | 24 |
| IW  | 345| 336 | 355| 349| 332| 340| 342| Ti I   | 89 | 92 | 88 | 86 | 94 | 93 | 86 |
| L   | 92 | 95  | 89 | 88 | 89 | 95 | 91 | Ge I   | 92 | 88 | 89 | 90 | 93 | 93 | 86 |
| W   | 23 | 22  | 24 | 23 | 24 | 25 | 21 | Tfe I  | 54 | 50 | 55 | 53 | 56 | 49 | 54 |
| AW  | 28 | 28  | 29 | 30 | 27 | 30 | 28 | Bfe I  | 59 | 60 | 61 | 58 | 62 | 58 | 55 |
| MW  | 39 | 37  | 40 | 39 | 36 | 41 | 41 | Tr I   | 32 | 31 | 33 | 30 | 34 | 34 | 30 |
| PW  | 64 | 66  | 61 | 62 | 60 | 63 | 65 | Cx I   | 65 | 62 | 66 | 64 | 60 | 61 | 60 |
| SBa | 12 | 12  | 11 | 12 | 12 | 12 | 12 | Leg I  | 479,479 | 479 | 479 | 463 | 484 | 470 | 462 |
| SBp | 16 | 15  | 16 | 15 | 16 | 15 | 15 | Ta II(L)| 79 | 82 | 76 | 75 | 83 | 79 | 81 |
| ISD | 68 | 66  | 69 | 65 | 64 | 66 | 68 | Ta II(H) | 22 | 23 | 22 | 22 | 23 | 21 | 21 |
| AL  | 30 | 28  | 30 | 29 | 29 | 32 | 31 | Ti II  | 77 | 75 | 79 | 76 | 77 | 77 | 76 |
| ML  | 30 | 30  | 29 | 30 | 28 | 29 | 32 | Ge II  | 71 | 72 | 73 | 68 | 74 | 69 | 68 |
| PL  | 34 | 35  | 36 | 34 | 33 | 34 | 32 | Tfe II | 44 | 41 | 39 | 40 | 42 | 45 | 46 |
| ASE | 53 | 50  | 55 | 52 | 50 | 56 | 51 | Bfe II | 38 | 37 | 34 | 35 | 37 | 39 | 40 |
| PSE | 72 | 69  | 74 | 66 | 70 | 75 | 71 | Tr II  | 36 | 38 | 39 | 39 | 42 | 43 | 35 |
| DS  | 28-42 | 27-43 | 29-43 | 28-40 | 26-40 | 28-44 | 30-42 | Cx II | 60 | 58 | 60 | 60 | 65 | 63 | 64 |
| PDS | 33-42 | 34-43 | 33-43 | 31-40 | 30-40 | 29-44 | 34-42 | Leg II | 405 | 403 | 400 | 393 | 419 | 415 | 410 |
| 1a  | 56 | 54  | 52 | 56 | 52 | 57 | 57 | Ta III (L)| 82 | 81 | 79 | 79 | 83 | 85 | 78 |
| 1b  | 45 | 42  | 45 | 46 | 41 | 47 | 41 | Ta III (H)| 19 | 19 | 20 | 19 | 20 | 19 | 20 |
| 2b  | 49 | 44  | 50 | 48 | 44 | 46 | 46 | Ti III | 94 | 96 | 92 | 89 | 97 | 92 | 91 |
| 3b  | 47 | 47  | 46 | 47 | 45 | 45 | 48 | Ge III | 78 | 75 | 79 | 74 | 77 | 79 | 77 |
| GL  | 88 | 90  | 88 | 85 | 85 | 92 | 82 | Tfe III | 51 | 51 | 55 | 55 | 54 | 56 | 50 |
| PaScFed | 33 | 34  | 35 | 33 | 31 | 35 | 31 | Bfe III | 51 | 49 | 54 | 49 | 55 | 56 | 54 |

**Etymology.** The new species is named on the name of Professor Dr. Yousif Al-Duraihim.

**Type.** Holotype larva was collected from 5 Km Taif road, Baha, Saudi Arabia, 20°7.918’N, 41°24.69’E, 24 April, 2013 (Coll. M. Kamran), from foxtail grass, *Setaria viridis* L. Paratypes six larvae, collection data same. Holotype and 6 paratypes (P1, P2, P3, P4, P5, P6) are deposited in the King Saud University Museum of Arthropods (KSMA) and Acarology Laboratory, Department of Plant Protection, College of Food and Agriculture Sciences, King Saud University. One paratype (P1- accession no. Acy: 14/45) has been deposited at the Agriculture Research Council, Plant Protection Research Institute, Biosystematics Division, Pretoria (ARC-PPRI), South Africa.

**Remarks.** *Balaustium yousifi* sp. n. closely resembles with *Balaustium florale* Grandjean. However it differs from *B. florale* by length of PSE (66-75 vs. 40-48); IP (1294-1363 vs. 850-988); ISD (64-69 vs. 42-48); fD (74 vs. 82). The new species can be distinguished from *B. bisculatae* Mayoral & Barranco by shorter ISD (65-69 vs. 56), fD (74 vs. 95), longer AL (28-32 vs. 24), longer TiIII (89-97 vs. 72-75), longer IP 1294-1348 vs. 1014-1042.
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| Ch. | H | P-1 | P2 | P3 | P4 | P5 | P6 | Ch. | H | P1 | P2 | P3 | P4 | P5 | P6 |
|-----|---|-----|----|----|----|----|----|-----|---|----|----|----|----|----|----|
| PaScFev | 22 | 21 | 20 | 23 | 20 | 23 | 22 | Tr III | 35 | 34 | 36 | 33 | 37 | 36 | 33 |
| PaScGed | 24 | 25 | 23 | 24 | 22 | 26 | 22 | Cx III | 61 | 64 | 58 | 59 | 57 | 59 | 60 |
| PaScGev | 18 | 17 | 18 | 19 | 17 | 20 | 18 | Leg III | 452 | 450 | 453 | 438 | 460 | 463 | 443 |
| Ta I (L) | 88 | 90 | 87 | 82 | 85 | 91 | 91 | IP | 1336 | 1326 | 1332 | 1294 | 1363 | 1348 | 1315 |
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