A Re-Description of Balaustium leanderi Comb. Nov. (Actinotrichida, Erythraeidae) with First First Report on Characteristics of All Active Instars and Taxonomic Notes on the Genus

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A RE-DESCRIPTION OF *BALAUSTIUM LEANDERI* COMB. NOV. (ACTINOTRICHIDA, ERYTHRAEIDAE) WITH FIRST FIRST REPORT ON CHARACTERISTICS OF ALL ACTIVE INSTARS AND TAXONOMIC NOTES ON THE GENUS

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Abstract

Balaustium leanderi (Haitlinger, 2000) **comb. nov.** (Actinotrichida: Erythraeidae), previously known only from the larval stage is re-described based on material originating from a laboratory culture of specimens collected in Colombia. This is also the first report of *Balaustium leanderi* (Haitlinger, 2000) *in* this country. The taxonomic characters of adult (female), deutonymph and larva are provided. The species re-described in this paper, is one of 37 nominal species presently assigned to the genus. With *Balaustium leanderi* (Haitlinger, 2000) there are just 6 species known both from larvae and active postlarval forms. *Palenqustium* Haitlinger (2000) is considered a junior synonym of *Balaustium*, which is one of 12 genera recognized within the Balaustiinae. A modified diagnosis of *Balaustium* von Heyden, 1826 is provided.

Key Words: Parasitengona, new generic synonym, taxonomy, *Balaustium*, Colombia

Resumen

Balaustium leanderi (Haitlinger, 2000) **comb. nov.** (Actinotrichida: Erythraeidae), conocido previamente en estado de larva fue re-descrito con base en material procedente de una cría en laboratorio de especímenes colectados en Colombia. Este también es el primer reporte de *Balaustium leanderi* (Haitlinger, 2000) en este país. Se describieron los caracteres taxonómicos de los adultos (hembras), deutoninfas y larvas. Esta es una de las 37 especies nominales actualmente asignadas al género. Junto con *Balaustium leanderi* (Haitlinger, 2000) solo hay seis especies cuyas formas larvales y postlarvales activas son conocidas. *Palenqustium* Haitlinger (2000) se considera un sinónimo menor de *Balaustium*, lo que resulta en un número verificado de 12 géneros que en la actualidad se distinguen en Balaustiinae. Se proporciona un diagnóstico modificado de Balaustium von Heyden, 1826.

Palabras Clave: Parasitengona, nuevo sinónimo genérico, taxonomía, *Balaustium,* Colombia

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Mites in the genus *Balaustium* von Heyden, 1826 belong to the family Erythraeidae and are one of 19 families recognized within the terrestrial Parasitengona (Mąkol & Wohltmann 2012). They are relatively large (ca. 1–2.5 mm long as adults), reddish in color, sometimes whitish to greenish in color. These mites can be found on the soil surface, on trees and plants or climbing the walls of buildings. All active instars of *Balaustium* and most likely other Balaustiinae, are predatory or pollen feeders (Newell 1963; Childers & Rock 1981; Hayes 1985; Halliday 2001; Mąkol et al. 2012; Muñoz-Cárdenas et al. in press), contrary to other members of Erythraeidae whose larvae parasitize arthropods.

Fig. 1. *Balaustium leanderi* **comb. nov.** Larva: Habitus, dorsal view, in vivo.

Of the 13 genera assigned to Balaustiinae (Mąkol & Wohltmann 2012, 2013), only the larvae and postlarval forms of *Balaustium* have been described. The mosaic distribution of instars known for other genera makes the critical reappraisal of the generic identity difficult and blurs conclusions on within-family relationships. At present, the genus *Balaustium* includes 36 species with only 5 known from both larvae and active postlarval forms (Mąkol & Wohltmann 2012, 2013).

The identity of most species of *Balaustium*, especially from the Southern Hemisphere, as already stated by Halliday (2001), is unresolved due to the unknown level of synonymy and the likelihood of misidentifications. Our knowledge of circumtropical Balaustiinae of the Western Hemisphere is based mostly on taxa known from larvae (Haitlinger 2000, 2005; Mąkol & Wohltmann 2012). The present paper contains a re-description of *Balaustium leanderi* (Haitlinger, 2000) **comb. nov.** based on material originating from Colombia and combined with first characteristics of all the stages. Some species of *Balaustium* are naturally associated with flower crops in Colombia (Torrado et al. 2001; Getiva & Acosta 2004) and may have potential for use in biological pest control.

Materials and Methods

Specimens taken from a laboratory colony (Jan 2012) were used for the studies presented in this article. The individuals used to start the

Supplementary Table 1. Abbreviations and explanation of measurements taken.

Abbreviation	Meaning
PaTr (L)	Length of palp trochanter
PaFe (L)	Length of palp femur
PaFe (W)	Width of palp femur
PaGe (L)	Length of palp genu
PaGe (W)	Width of palp genu
PaTi (L)	Length of palp tibia
PaTi (W)	Width of palp tibia
PaTa (L)	Length of palp tarsus
PaTa (W)	Width of palp tarsus
Odo	Length of odontus
IL	Length of idiosoma (without gnathosoma)
IW	Width of idiosoma (the widest point)
GL	Length of gnathosoma
AL(n)	Number of setae AL (normal setae on anterior sensillary area of crista metopica)
ASE=Asens	Length of sensillary setae on anterior sensillary area of crista metopica
PSE=Psens	Length of sensillary setae on posterior sensillary area of crista metopica
Sba	Distance between ASens bases
SBp	Distance between PSens bases
L	Length of scutum
W	Width of scutum
ISD	Distance between the level of ASens and PSens
AL	Length of non-sensillary setae of first pair on scutum
ML	Length of non-sensillary setae of second pair on scutum
PL	Length of posterior non-sensillary setae (third pair) on scutum
AW	Distance between AL bases
MW	Distance between ML bases
PW	Distance between PL bases

Fig. 25. *Balaustium leanderi* **comb. nov.** Deutonymph: Habitus, dorsal view, in vivo.

colony were collected in Chía, Sabana de Bogotá, Colombia (N 04° 55' 00" – W 74° 03' 00") and transferred to the Center of Biosystems of the Jorge Tadeo Lozano University (CBIOS-UJTL). The colony of mites was kept in plastic containers in environmentally controlled rooms (temperature of 22.1 ± 2.0 °C, 75% RH and 12:12 h L:D photoperiod. A total of 15 adult specimens were introduced in a plastic container (18 cm diam, 20 cm height) with an opening (10 cm diam) covered by a mite-proof steel mesh for ventilation. Representatives of *Balaustium* were provided with plant material infested with all stages of spider mites (*Tetranychus urticae* Koch; Tetranychidae), western flower thrips (*Frankliniella occidentalis* (Pergande) Thysanoptera:Thripidae) and whiteflies (*Trialeurodes vaporariorum* Westwood; Hemiptera: Aleyrodidae), which served as food (Muñoz et al. 2009; Muñoz-Cárdenas et al. 2014).

For the purpose of light microscopy the material was cleared in 85% lactic acid or in Nesbitt fluid and mounted in Hoyer's solution to create permanent slides. Measurements were taken under Leica DNL and Nikon Eclipse E600 microscopes equipped with differential interference contrast; drawings were made with Leica DNL equipped with camera lucida and processed with Adobe illustrator CS5 (Supplementary Table 1). We calculated averages and standard errors of all

TABLE 1. MORPHOMETRIC DATA OF *BALAUSTIUM LEANDERI* LARVAE. X = MEASUREMENTS (μM). SE = STANDARD ERROR.

Character	X (*n* = 12)	SE
PaTr (L)	29.299	0.751
PaFe (L)	73.848	2.257
PaFe (W)	31.190	1.192
PaGe (L)	62.232	2.096
PaGe (W)	24.652	0.446
PaGe L/W	2.077	0.291
PaTi (L)	16.047	0.428
PaTi (W)	17.045	0.273
PaTa (L)	25.379	1.019
PaTa (W)	5.052	0.112
Odo	24.434	0.788
GL	138.463	4.817
LB	575.129	17.794
WB	381.271	31.857
LB/WB	1.574	0.078
ASE = Asens	57.639	1.860
PSE = Psens	79.639	1.695
AL.	35.387	2.360
ML	36.611	1.290
PL	37.426	0.867
AW	41.649	0.961
MW	39.214	0.630
PW	47.735	0.824
Sba	13.193	0.344
SBp	15.648	0.280
L	111.646	2.477
W	51.426	1.302
ISD	76.123	1.581
MDS	39.918	1.032
PDS	34.844	1.098
MVS	33.795	1.036
OCM	61.834	8.801
OAS	84.726	4.238
OPS	50.279	4.300
O	17.760	0.495
O – O	136.398	6.686
Cx I	71.433	2.564
Tr I	52.487	1.434
bFe I	70.563	2.790
tFe I	62.734	1.582
Ge I	127.627	2.291
Ti I	129.855	3.926
Ta I	107.912	1.016
Ta I (H)	35.668	1.687
Leg I	627.094	12.139
Cx II	81.518	3.184
Tr II	46.620	1.228
Bf II	55.976	1.829
tFe II	51.133	1.087
Ge II	96.745	1.632
Ti II	113.115	1.946
Ta II	92.012	1.577

TABLE 1. (CONTINUED) MORPHOMETRIC DATA OF *BALAUSTIUM LEANDERI* LARVAE. X = MEASUREMENTS (μM). SE = STANDARD ERROR.

Character	X (n = 12)	SE
Ta II (H)	28.850	1.186
Leg II	541.403	8.020
Cx III	85.276	2.259
Tr III	51.255	1.274
Bf III	65.908	1.652
tFe III	65.721	0.995
Ge III	113.547	1.375
Ti III	145.193	2.106
Ta III	105.673	1.397
Ta III (H)	27.662	1.164
Leg III	632.572	7.913
IP	1703.693	78.652

measurements using Excel 2007. The terminology follows Mąkol (2010), with updates contained in Mąkol et al. (2012). All measurements are given in micrometers (µm). In NDV formula setae on idiosoma dorsum (fD), arising behind the level of the scutum, setae placed between coxae II and III as well as ventral setae located behind the level of coxae III (fV) were considered. Also the holotype of *Palenqustium leanderi* Haitlinger, 2000 (deposited in the place: Museum of Natural History, University of Wrocław) was examined.

RESULTS

BALAUSTIUM VON HEYDEN, 1826

Guatustium Haitlinger, 2000

Palenqustium Haitlinger, 2000, **syn. nov.**

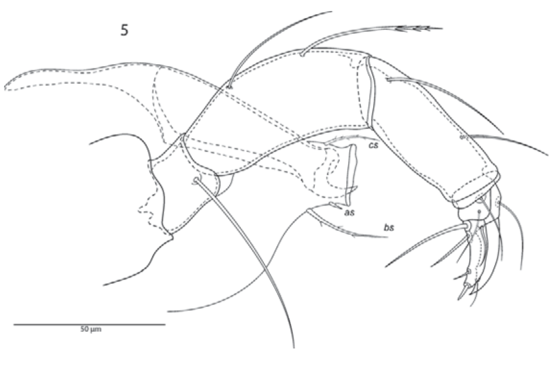


Fig. 5. *Balaustium leanderi* **comb. nov.** Larva: Gnathosoma, lateral view.

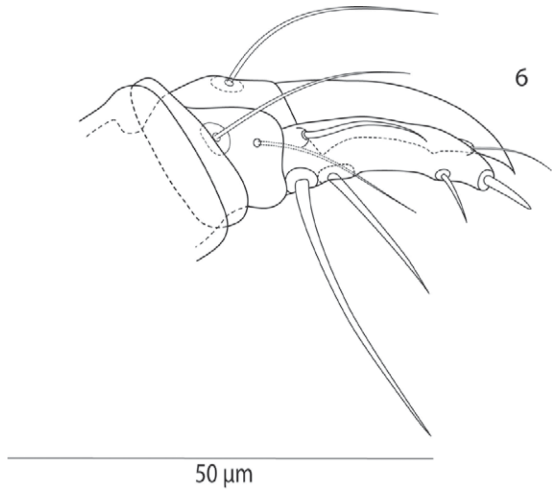


Fig. 6. *Balaustium leanderi* **comb. nov.** Larva: Palp tibia and palp tarsus, lateral view.

Balaustium leanderi (Haitlinger, 2000) Fuentes, 2013

Diagnosis (after Southcott 1961, but modified)

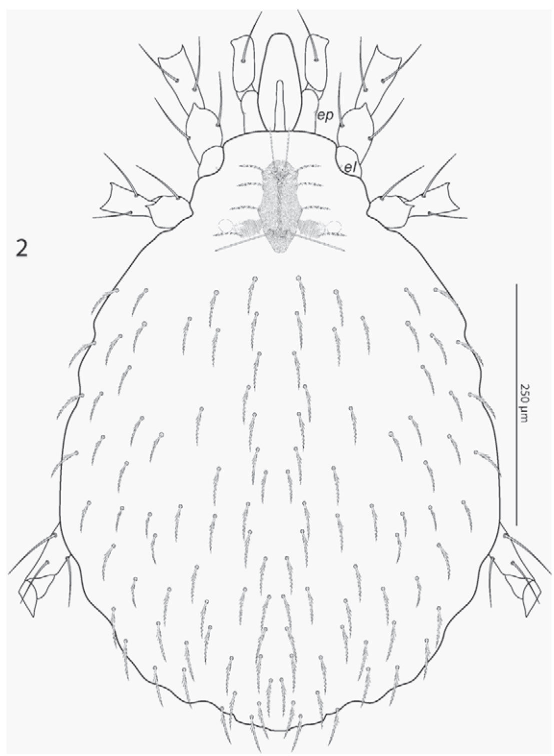
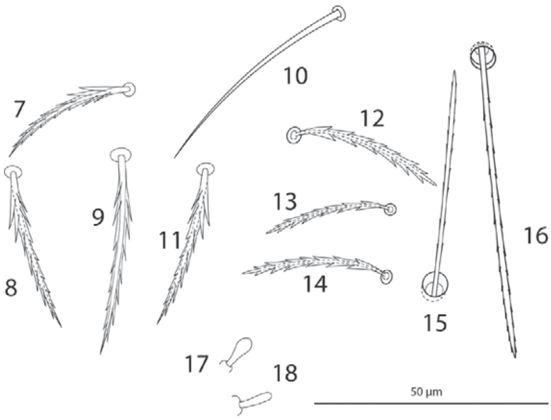


Fig. 2. *Balaustium leanderi* **comb. nov.** Larva: Idiosoma, dorsal view. Structure of integument partly shown (between scutum and eyes).



Figs. 7-18. *Balaustium leanderi* **comb. nov.** Larva: 7. Dorso-lateral seta; 8. Postero-dorsal seta; 9. Mid-dorsal seta; 10. Mid-ventral seta; 11. Postero-ventral seta; 12. Seta AL; 13. Seta ML; 14. Seta PL; 15; Anterior sensilla (ASens); 16. Posterior sensilla (PSens); 17. Seta eI; 18. Seta ep.

Adult and Deutonymph. Crista metopica inserted in the scutum. One eye on each side of the prodorsum. A pair of urnulae located posteriorly to the eyes. Odontus with ventral protrusion.

Larva. Crista metopica inserted in the scutum. One eye on each side of the prodorsum. Urnulae absent. Odontus with ventral protrusion. One seta on the palp trochanter, 1–2 setae on the palp femur. f_nCx 1–1–1, f_nTr 3–3–[2–3], f_nbFe 4–4–[2–4]. Posterior claw on tarsi I–III bifurcate, composed of a simple and of pulvilliform branch.

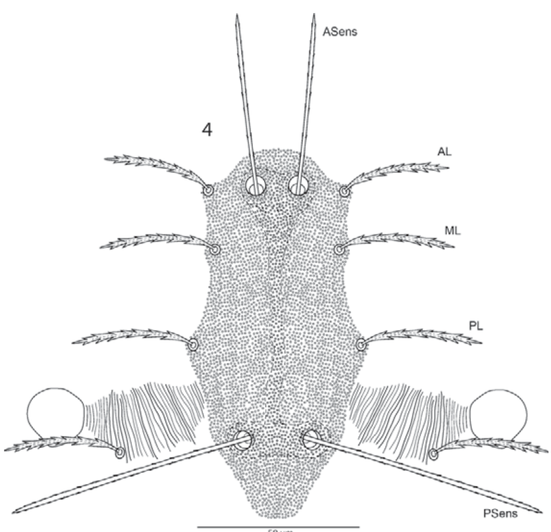


Fig. 4. *Balaustium leanderi* **comb. nov.** Larva: Dorsal scutum and eyes. Structure of cuticle partly shown (between scutum and eyes).

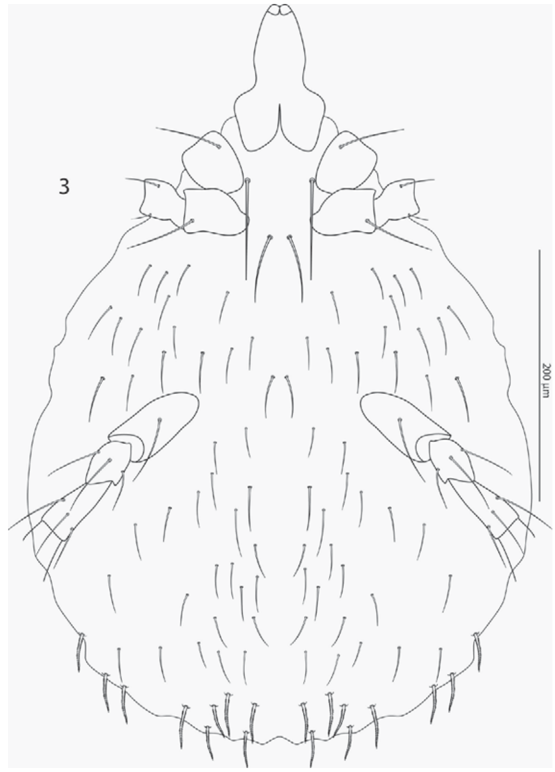
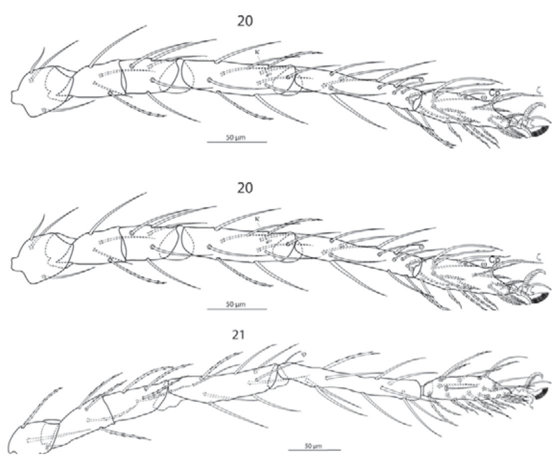


Fig. 3. *Balaustium leanderi* **comb. nov.** Larva: Idiosoma, ventral view.

BALAUSTIUM LEANDERI (HAITLINGER, 2000) FUENTES, 2013

Balaustium leanderi (Haitlinger, 2000), **comb. nov.**

Palenqustium leanderi Haitlinger, 2000



Figs. 19-21. *Balaustium leanderi* **comb. nov.** Larva, legs (coxae omitted): 19. Leg I; 20. Leg II; 21. Leg III.

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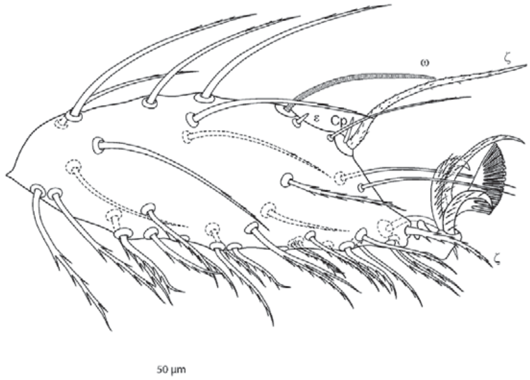

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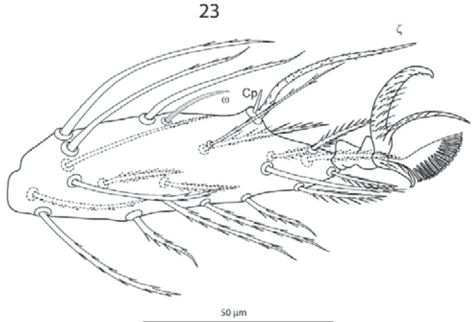

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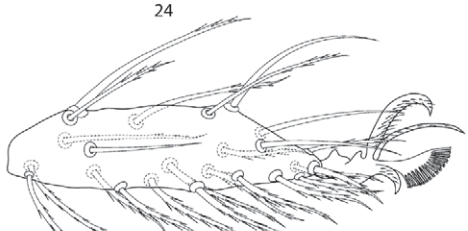

Figs. 22-24. *Balaustium leanderi* **comb. nov.** Larva: 22. Tarsus leg I; 23. Tarsus leg II (subterminal eupathidium not shown); 24. Tarsus leg III (subterminal eupathidium not shown).

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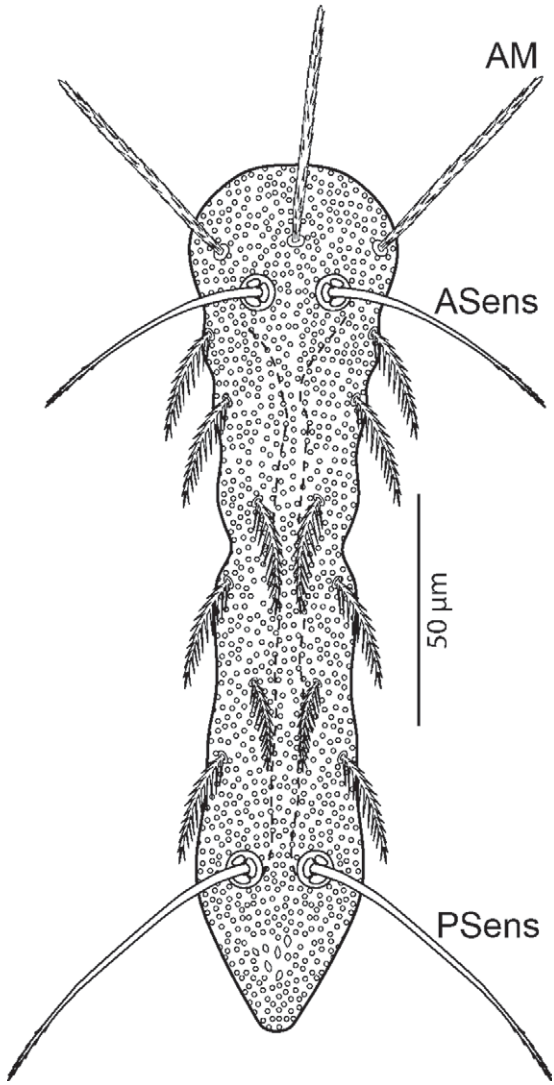


Fig. 26. *Balaustium leanderi* **comb. nov.** Deutonymph: Dorsal scutum.

Diagnosis

Larva. Palp femur with 2 setae. PaGe L/W 1.84–2.80. fD 102–120, NDV 188–219. ISD 66–83. f_nbFe 4–4–4. f_nTr 3–3–3. IP 1662–1893. Setae on palp tarsus smooth.

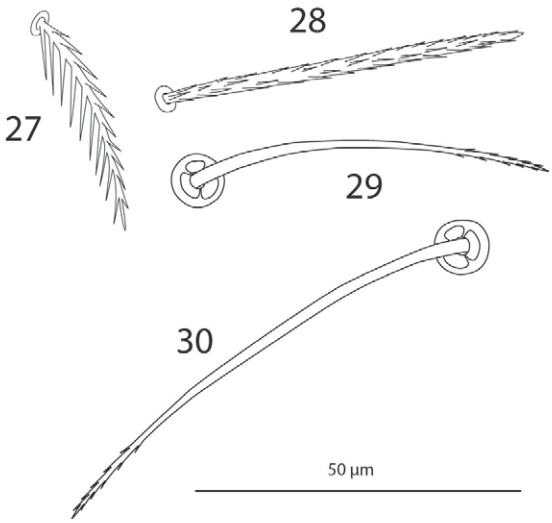
Deutonymph and Adult (Female). Semipectinalae on palp genu absent. pDS 23–46. PaGe L/W 2.45–3.15 (deutonymph), 3.06–3.63 (adult).

Male. Not known.

For comparison with other taxa see Remarks on taxonomy.

Description

Body oval in shape. Color in life red, with longitudinal rows of whitish setae on opisthosomal dorsum; the pattern weakly marked in larvae (Fig. 1), more distinct in deutonymphs (Fig. 25) and the most contrasting in adults (Fig. 33).



Figs. 27-30. *Balaustium leanderi* **comb. nov.** Deutonymph: 27. Seta arising on scutum between the level of ASens and PSens; 28. Seta AM; 29. Anterior sensilla (ASens); 30. Posterior sensilla (PSens).

Larva (Figs. 1–24). Metric data are provided in Table 1. Meristic data are based on fifteen specimens.

Gnathosoma. Chelicerae composed of basal segment and movable claw (Fig. 5). Adoral setae (*cs*) and subcapitular setae (*bs*) of similar length (c. 23), with few tiny barbs. Setae *as* (c. 2 µm) short, acicular. Palps slender, PaGe L/W 1.84–2.80. Pedipalp setal formula (fPp) N-NB-NN-NNN-NNNNζω (Figs. 5 and 6). Odontus with tooth-like protrusion located ventrally at *c*. 3/5 of the claw length. Palpal supracoxalae (*ep*, *c*. 4 µm) thumb-like (Fig. 18).

Idiosoma, Dorsal Side (Fig. 2). Behind the level of crista metopica 102–118 barbed, similar in shape, setae (Figs. 7–9). Scutum (Fig. 4) indistinct, with weakly marked margins. Crista well sclerotized, extending between bases of ASens and PSens. Setae AL, PL and ML (Figs. 12–14) of similar length, all barbed; PL located within or off scutum. AL leveled with ASens or slightly posterior of ASens. ASens shorter than PSens, both barbed distally (Figs. 15–16).

Idiosoma, Ventral Side (Fig. 3). Sternalae 1a and 2a present between coxae I and II, respectively, 30–35 setae between coxae II-III and 56–66 setae behind coxae III, all nude (Fig. 10). Setae located along the posterior margin of opisthosoma (Fig. 11) barbed, similar to those covering the idiosoma dorsum.

Legs (Figs. 17, 19–24). Leg segmentation formula 7–7–7; leg chaetotaxy: leg I: Cx 1B, Tr 3B, bFe 4B, tFe 5B, Ge 9B + 1σ+ 1κ, Ti 11B + 2φ + 1κ, Ta 33–35B + 2ζ + 1Cp + 1ω + 1ε; leg II: Cx

Table 2. Morphometric data of the *Balaustium leanderi* deutonymph. X = measurements (µm). SE = standard error.

Character	X (n = 9)	SE
PaTr (L)	40.854	3.065
PaFe (L)	121.124	6.146
PaFe (W)	48.464	3.399
PaGe (L)	97.075	3.390
PaGe (W)	34.114	1.940
PaTi (L)	27.284	1.073
PaTi (W)	24.416	0.824
PaTa (L)	32.027	1.635
PaTa (W)	10.466	0.447
Odo	29.983	0.606
IL	946.833	59.194
IW	712.373	56.149
IL/IW	1.351	0.052
AL (n)	4.000	0.000
ASE = Asens	62.119	1.270
PSE = Psens	86.023	1.682
SBa	16.953	0.431
SBp	16.217	0.600
L	215.836	6.414
W	39.736	1.158
ISD	149.783	4.144
mDS	32.245	0.824
pDS	28.106	1.003
pVS	43.387	0.941
O	21.992	0.479
Ur	29.063	1.596
AOP	39.964	2.549
Cx I	200.860	9.738
Tr I	87.202	3.438
bFe I	116.573	4.443
tFe I	206.408	6.512
Ge I	240.784	10.788
Ti I	238.952	10.296
Ta I	160.169	4.330
Ta I (H)	63.681	3.070
Leg I	1250.948	38.214
Cx II	162.104	6.419
Tr II	77.442	1.357
bFe II	89.178	4.273
tFe II	129.924	5.150
Ge II	146.980	6.558
Ti II	178.028	5.966
Ta II	109.079	2.996
Ta II (H)	47.644	2.483
Leg II	892.736	29.479
Cx III	144.167	4.946
Tr III	77.932	2.605
bFe III	91.296	5.414
tFe III	148.671	7.099
Ge III	181.532	6.697
Ti III	216.811	9.572
Ta III	109.549	2.962

TABLE 2. (CONTINUED) MORPHOMETRIC DATA OF THE *BALAUSTIUM LEANDERI* DEUTONYMPH. X = MEASUREMENTS (μM). SE = STANDARD ERROR.

Character	X (*n* = 9)	SE
Ta III (H)	43.018	3.221
Leg III	969.958	30.675
Cx IV	186.919	4.868
Tr IV	80.313	4.241
bFe IV	116.305	7.536
tFe IV	210.946	9.339
Ge IV	231.647	11.234
Ti IV	270.468	10.239
Ta IV	110.436	3.619
Ta IV (H)	44.160	2.943
Leg IV	1207.033	45.119
IP	4320.675	138.280

1B, Tr 3B, bFe 4B, tFe 5B, Ge 8–10B + 1κ, Ti 10–12B + 2φ, Ta 23–25B + 2ζ + 1Cp + 1ω; leg III: Cx 1B, Tr 3B, bFe 4B, tFe 5B, Ge 9B, Ti 10–11B + 1φ, Ta 22–25B + 1ζ. supracoxala of leg I (*eI*, *c*. 3 μm) thumb-like (Fig. 17). Normal setae on legs I–III slightly barbed along the entire stem or close to the tip. On legs II and III (Figs 20, 23) setae with adhering setules, making an impression of seta being nude, are also present. On tarsi I–III several setulated setae resembling the eupathidia, nude and bent apically, with blunt termination most often oriented towards the basal part of tarsus, arise along the ventro-lateral margin of the segment. Dorsal eupathidia on tarsi I-II ciliated along the entire stem, with adjacent companalae. Tarsi I–III terminated with 2 claws and claw-like empodium. Anterior claw sickle-like, ciliated, posterior claw composed of 2 branches: one similar to anterior claw but shorter and another one terminated with discoid, pulvilliform structure.

Deutonymph (Figs. 25–32). Metric data provided in Table 2. Meristic data based on 9 specimens.

Gnathosoma. Palps (Fig. 31) slender. Palp trochanter with 5 setae, of which one (*c*. 140)

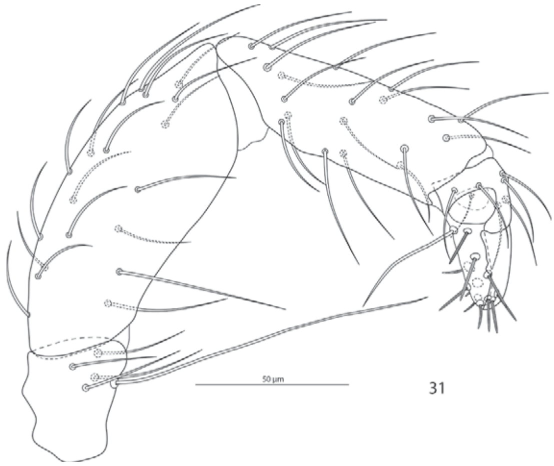


Fig. 31. *Balaustium leanderi* **comb. nov.** Deutonymph: Palp, medial aspect.

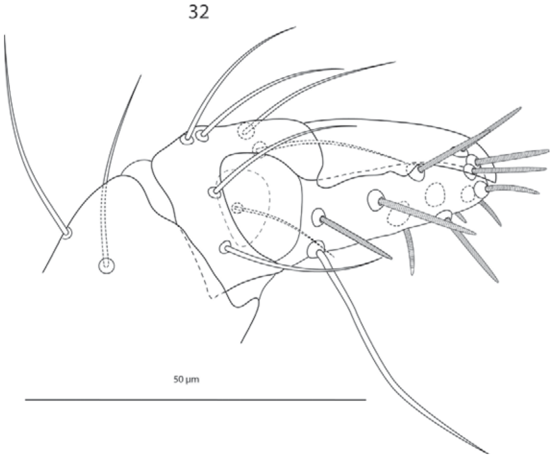


Fig. 32. Balaustium leanderi comb. nov. Deutonymph: Palp tibia and palp tarsus, medial aspect.

Fig. 33. *Balaustium leanderi* **comb. nov.** Adult female: Habitus, dorsal view, in vivo.

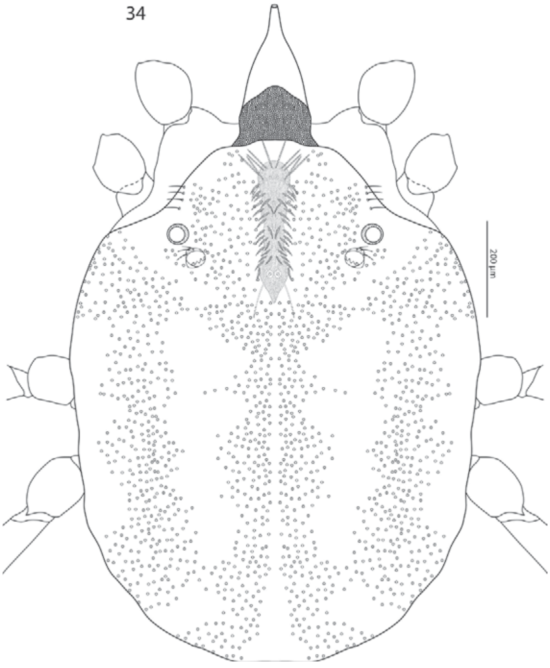


Fig. 34. *Balaustium leanderi* **comb. nov.** Adult female: Idiosoma, dorsal view.

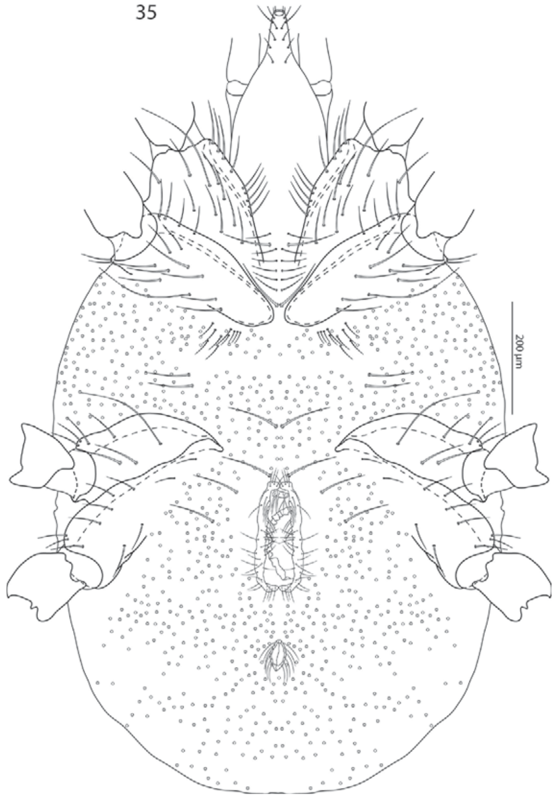


Fig. 35. *Balaustium leanderi* **comb. nov.** Adult female: Idiosoma, ventral view.

is much longer than the remaining ones, palp femur with 19–23 setae, palp genu with 19–21 setae, palp tibia with 7 setae. Setae on PaTr – PaTi either nude or weakly barbed. Palp tarsus (Figs. 31 and 32) with one long, nude seta located proximally and with *c*. 11 solenidia. Palpal supracoxalae *ep* (*c*. 4 µm) thumb-like.

Idiosoma, Dorsal Side. Crista metopica well sclerotized and inserted in scutum (Fig. 26). ASens (Fig. 29) shorter than PSens (Fig. 30), both with tiny barbs in the distal part. A group to 3 to 5 AM setae (Fig. 28), covered with short, adhering setules and placed anterior of, or at the level of ASens. Eight to 12 setae (Figs. 26 and 27) located within scutum, between ASens and PSens. Single eyes at each side of symmetry axis, *c*. at the level of posterior sensillae. Urnulae placed postero-medially to eyes. Dorsal opisthosomal setae uniform in shape. Setal stem with 3 cuticular ridges, running from the base to the top of seta; along one ridge the relatively long, narrowing apically setules are distributed; 2 other ridges covered with relatively short, robust and not sharpened terminally setules (see Figs. 51 and 52, for adults).

Idiosoma, Ventral Side. Ventral setae acicular, longer than the dorsal setae, either smooth or with very tiny barbs. One seta on coxae I, II and III distinctly longer than the remaining coxal setae. At the level of coxae I and II, medially, 2 pairs of setae much longer than the remaining ventral setae. Another 2–3 pairs of distinctly elongated setae present anterior of and at the level of coxae III-IV.

Legs. Supracoxal setae *eI* (*c*. 6 µm) tiny and thumb-like. Two supracoxalae *eII* (*c*. 6 µm) present on each of coxae II, dorsally, in antero-lateral position. All legs covered with very weakly barbed or nude setae; setulose setae arise along ventral and ventro-lateral surface of tarsi. Specialized setae of leg I: Ge 3σ + 1κ, Ti 4φ + 1κ, Ta 1ω (in dorsal position), 12–14ω (placed laterally) + 2–3ζ + 1ε; leg II: Ge 1–2σ + 1κ, Ti 3–4φ, Ta 2–3ω + 2ζ; leg III: Ge 1–2σ, Ti 2φ, Ta 1ω + 2ζ; leg IV: Ge 2σ, Ti 2φ, Ta 2ζ; along the ventral surface of tarsi, several eupathidium-like setae, similar to other setulose setae but with blunt tip present; these setae are especially numerous on tarsus I. Tarsi terminated with paired, covered with fimbriae, claws.

Adult, Female (Figs. 33–52).

Metric data provided in Table 3. Meristic data based on 11 specimens. Body setation more dense than in deutonymphs.

Gnathosoma. Palps slender (Figs. 39 and 40). Palp trochanter with 6 nude setae, of which

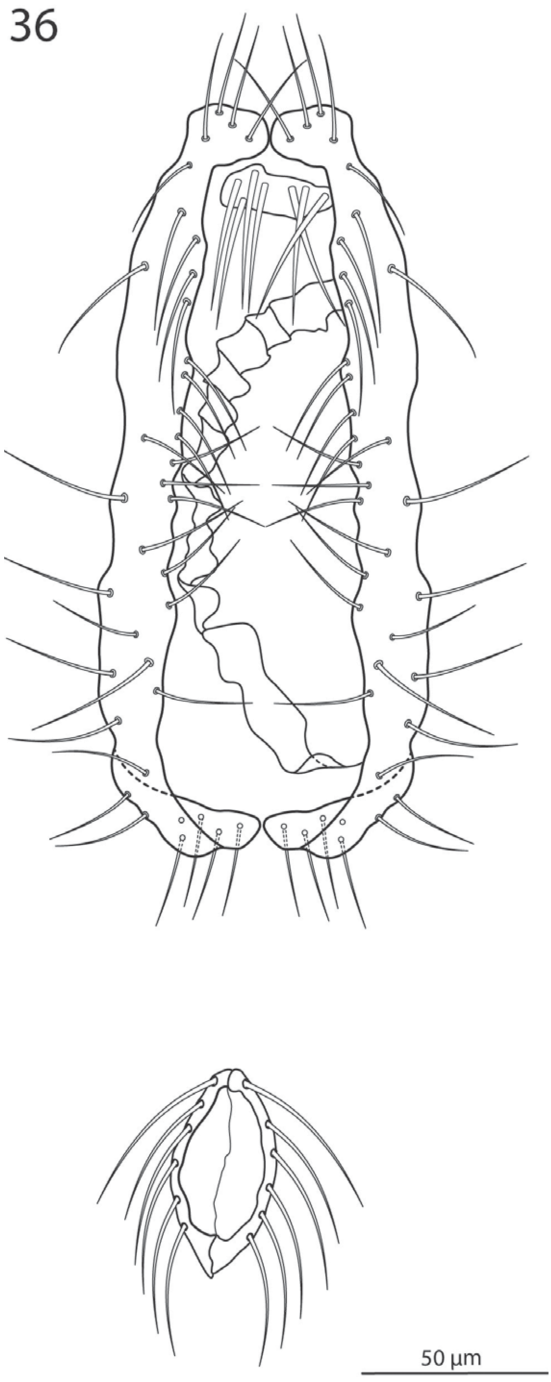


Fig. 36. *Balaustium leanderi* **comb. nov.** Adult female: Genital and anal region.

one (*c*. 178) is much longer than the remaining setae. Palp femur with 44–48 setae, palp genu with 34–38 setae, palp tibia (Figs. 41 and 42) with 10–12 setae, all setae nude or weakly barbed. Palp tarsus (Figs. 41 and 42) with one

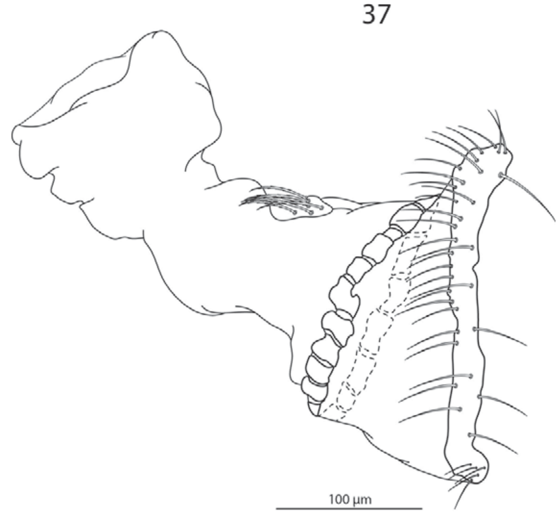


Fig. 37. *Balaustium leanderi* **comb. nov.** Adult female: Extruded ovipositor.

long, nude seta and with *c*. 20 solenidia. Supracoxalae *ep* thumb-like (*c*. 5 µm).

Idiosoma, Dorsal Side. Dorsal view as in Fig. 34. Rod of crista metopica extended between bases of ASens and PSens and inserted in well sclerotized, narrowing posteriorly scutum (Fig. 38). ASens and PSens sparsely setulose in distal part (Figs. 38, 44 and 45), ASens always shorter than PSens. Five to 10 non-sensillary setae AM, with adhering setules (Figs. 38 and 43). *Circa* 32–40 setae, similar in shape to opisthosomal setae, arise on scutum, between the level of ASens and PSens (Figs. 38 and 46). Single eyes at each side of symmetry axis, placed before or at the level of posterior sensillae. Urnulae located postero-medially to eyes (Fig. 34). Dorsal opisthosomal setae (Figs. 47–49, 51 and 52) as in deutonymphs.

Ventral Side of Idiosoma. Dorsal view as in Fig. 35. Ventral setae and setae on coxae similar to those occurring in deutonymphs. At opisthosoma termination ventral setae display transitional form between mid-ventral and dorsal ones. Genital opening elongate, with extrusible ovipositor (Figs. 36 and 37), genital valves covered with setae similar in shape to ventral setae, but shorter (Fig. 50). Anus (Fig. 36) oval, surrounded by distinct sclerite with *c*. 12 setae.

Legs. One supracoxala *eI* (8 µm) and 2 supracoxalae *eII* (8 µm), all tiny, thumb-like, located in dorso-lateral part of coxal plates. Leg segments with weakly barbed or nude setae, setae covered with setules arise along ventral and ventro-lateral side of tarsi. Specialized setae of leg I: Ge 5σ + 1κ, Ti 14φ + 1κ, Ta *c*. 15ω + 4ζ + 1ε; leg II: Ge 2–3σ + 1κ, Ti 6φ, Ta *c*. 6ω + 2-4ζ; leg III: Ge 2–3σ, Ti 3–4φ, Ta 3–4ω + 2-4ζ;

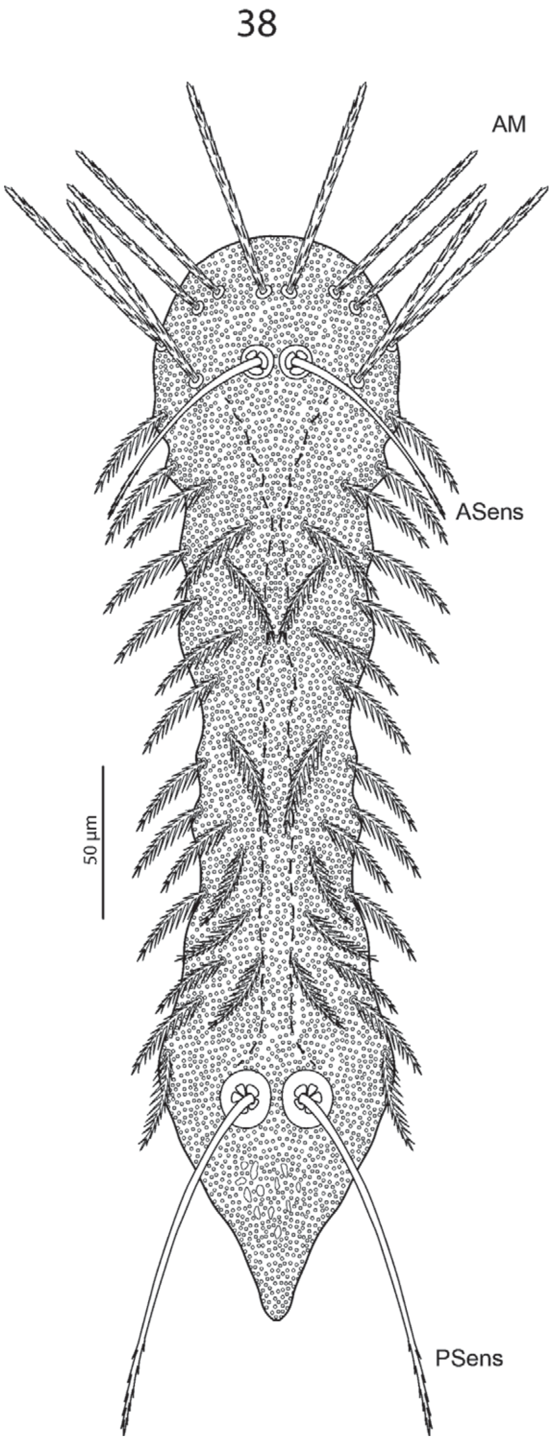


Fig. 38. *Balaustium leanderi* **comb. nov.** Adult female: Dorsal scutum.

leg IV: Ge 4σ, Ti 4φ, Ta *c*. 2ω + 2-4ζ. Setae of eupathidium-type, not sharpened terminally and covered with setules, slightly bent towards proximal part of the segment, especially numerous on tarsus I, present among other setulose setae arising at ventral side of tarsi. Tarsi terminated with paired claws, each claw covered with fimbriae.

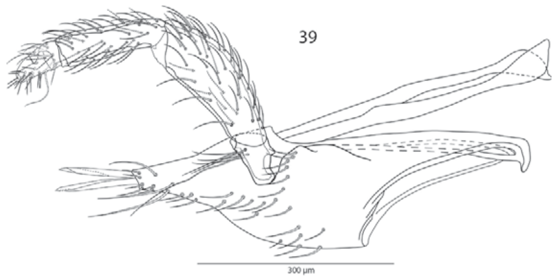


Fig. 39. *Balaustium leanderi* **comb. nov.** Adult female: Gnathosoma, lateral aspect.

Material Deposition

A series of specimens, comprising 4 adult females (ICN-Ac-155–ICN-Ac-158), 4 deutonymphs (ICN-Ac-159–ICN-Ac-162) and 4 larvae (ICN-Ac-163–ICN-Ac-166) is deposited in the "Instituto de Ciencias Naturales ICN, Universidad Nacional de Colombia". Three adults, 3 deutonymphs and 3 larvae are deposited in the collection of the Laboratory of Entomology, University of Bogotá Jorge Tadeo Lozano. Four slide-mounted adults (OSAL006617–006620) are deposited in the acarological collection of the Ohio State University. Two adults, 2

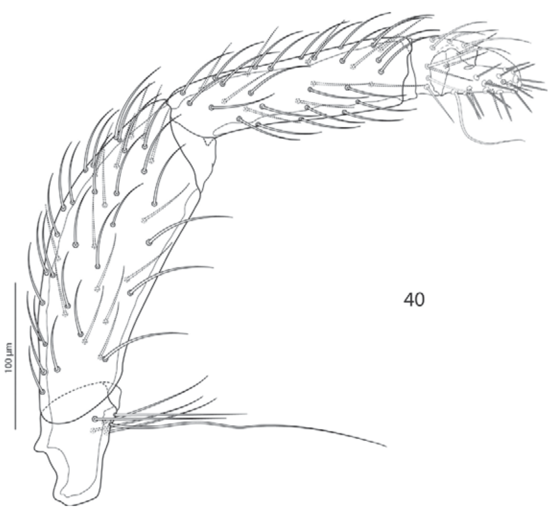
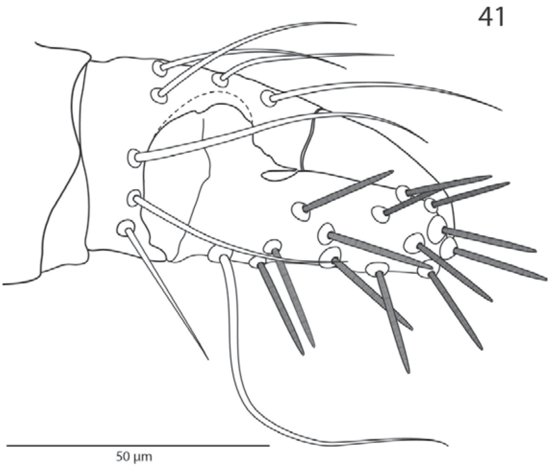
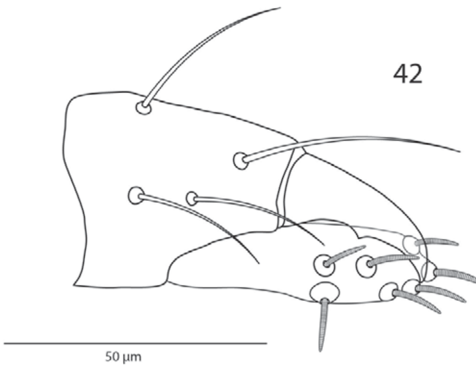
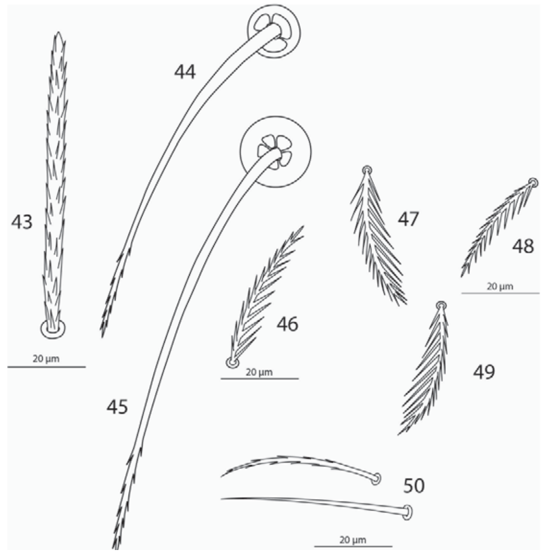


Fig. 40. *Balaustium leanderi* **comb. nov.** Adult female: Palp, lateral aspect.





Figs. 41 and 42. *Balaustium leanderi* **comb. nov.** Adult female: 41. Palp tibia and palp tarsus, lateral aspect; 42. Palp tibia and palp tarsus, medial aspect.



Figs. 43-50. *Balaustium leanderi* **comb. nov.** Adult female: 43. AM seta; 44. Anterior sensilla (ASens); 45. Posterior sensilla (Psens); 46. Seta arising on scutum between the level of ASens and PSens; 47. Mid-dorsal seta; 48. Latero-dorsal seta; 49. Postero-dorsal seta; 50. Genital setae.

deutonymphs and 5 larvae - in the collection of the Department of Invertebrate Systematics and Ecology, Wrocław University of Environmental and Life Sciences.

Distribution

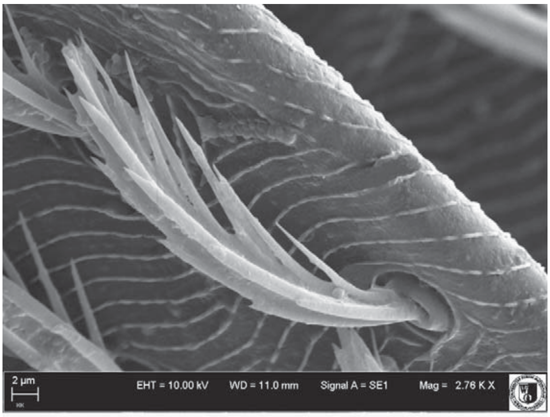
Colombia, Mexico.

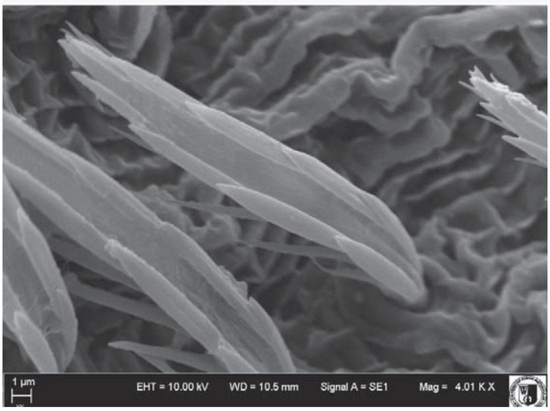
Remarks on Taxonomy

The following set of diagnostic characters allow to differentiate between larvae of *Balaustium* spp. and of other balaustiine genera: the palp tibial claw with a prominent tooth on ventral surface, one seta on palp trochanter, 1–2 setae on palp femur and 3 setae on trochanter I (see also Diagnosis). Some of these characters, however, can be recognized also in other balaustiine genera known from larvae.

The presence of 2 setae on the palp femur, combined with the presence of one seta on the palp trochanter in larvae has been stated for monotypic *Palenqustium* Haitlinger, 2000 and also for *Pollux kovalamicus* Haitlinger, 2002. However, the members of *Pollux* Southcott, 1961 can be distinguished from *Balaustium* spp. by different termination of tarsus III. *Palenqustium*, with *Palenqustium leanderi* was described by Haitlinger (2000) based on 2 larvae collected from plants in Mexico. The simple odontus, without median tooth, 2 setae on the palp femur, bFe 4–4–4, Tr 3–3–3 and Ge 9–9–9, were listed as diagnostic characters for newly erected genus.

Examination of the holotype of *Palenqustium leanderi*, revealed that the distinct tooth is present at *c*. half length of the tibial claw, ventrally. Also, one barbed seta and one nude (instead of 2 nude setae) are present on palp femur, whereas the chaetotaxy of tibia II includes 10 normal setae and 2 solenidia. Thus the data contained in the original description should be corrected for fPp N-NB-NN-NNN-NNNNζω, f_nTi 11–10–11 and f_{sol}Ti 2–2–1. Additionally, the AL setae are leveled with ASens (AL anterior of ASens stated in the original description might have been due to the shift of the left side of the idiosoma towards anterior position in relation to the right side of the body). The above verification of diagnostic characters, results in the presence of character states which are observed also in some members of *Balaustium*. Hence the separate identity of *Palenqustium* Haitlinger, 2000 is not justified anymore and the latter ge-





Figs. 51 and 52. *Balaustium leanderi* **comb. nov.** Adult female, SEM micropgraphs: 51. Dorsal seta, side view; 52. dorsal seta, view from above.

nus should be considered a junior synonym of *Balaustium* von Heyden, 1826. Moreover, the discrepancy in data contained in the original description, applying to the ISD value (50 – in the diagnosis, 68 and 78 – for the holotype and paratype, respectively – in the table), should be corrected in favor of the value provided in the table. PaGe L/W ratio in *Balaustium leanderi* comb. nov. equals 70 in the holotype.

Balaustium leanderi **comb. nov.** shares generic traits with other members of the genus, as evidenced by data on larvae and active postlarval forms. Difference between the larvae of *Balaustium leanderi* and of other *Balaustium* spp., besides the presence of 2 setae on the palp femur, pertains also to the number of normal setae on the basifemur (f_nbFe 4–4–4). The formula f_nbFe 4–4–4 has been known also for the monotypic *Moldoustium* Haitlinger, 2008, but the separate generic identity of the latter genus is supported by the absence of setae on the palp trochanter (vs one seta present in *Balaustium*).

Active postlarval forms of *Balaustium leanderi* belong to the group of *Balaustium* spp.

TABLE 3. MORPHOMETRIC DATA OF THEADULT FEMALE *BALAUSTIUM LEANDERI*. X = MEASUREMENTS (µM). SE = STANDARD ERROR.

Character	X (n = 9)	SE
PaTr (L)	70.627	1.019
PaFe (L)	215.210	4.265
PaFe (W)	73.203	1.895
PaGe (L)	157.997	2.811
PaGe (W)	48.313	0.741
PaTi (L)	43.432	0.771
PaTi (W)	36.906	0.593
PaTa (L)	55.230	0.864
PaTa (W)	17.118	0.363
Odo	35.973	0.806
IL	1496.460	101.228
IW	1168.583	69.545
IL/IW	1.281	0.035
AL(n)	6.800	0.279
ASE=Asens	80.532	2.299
PSE=Psens	104.030	1.244
Sba	19.147	0.323
SBp	21.259	0.517
L	346.369	6.416
W	66.119	4.043
ISD	241.859	3.829
MDS	34.762	0.869
PDS	35.478	0.499
MVS	50.004	3.347
OCM	212.414	10.106
OAS	294.393	11.962
OPS	247.114	12.008
O-Ur	38.373	1.470
O	32.186	0.617
Ur	38.739	0.918
O - O	490.971	22.874
GOP	247.220	8.017
AOP	65.032	1.223
Cx I	323.492	9.693
Tr I	163.541	5.865
bFe I	198.466	6.669
tFe I	368.613	8.173
Ge I	432.324	8.363
Ti I	419.004	7.005
Ta I	273.453	4.701
Ta I (H)	94.730	2.595
Leg I	2188.191	39.276
Cx II	277.133	4.796
Tr II	136.110	6.033
bFe II	145.000	2.837
tFe II	233.097	4.359
Ge II	266.953	5.368
Ti II	295.582	5.833
Ta II	178.142	3.392
Ta II (H)	73.139	2.750
Leg II	1532.018	26.492
Cx III	258.866	5.967

TABLE 3. (CONTINUED) MORPHOMETRIC DATA OF THEADULT FEMALE *BALAUSTIUM LEANDERI*. X = MEASUREMENTS (μM). SE = STANDARD ERROR.

Character	X (n = 9)	SE
Tr III	139.838	5.265
bFe III	154.393	3.367
tFe III	274.544	5.903
Ge III	316.480	6.290
Ti III	343.344	7.653
Ta III	180.254	3.635
Ta III (H)	70.482	1.871
Leg III	1667.720	31.759
Cx IV	331.493	9.423
Tr IV	157.453	6.297
bFe IV	203.116	4.570
tFe IV	378.071	6.616
Ge IV	417.560	9.277
Ti IV	457.026	8.016
Ta IV	187.513	4.423
Ta IV (H)	68.337	1.867
Leg IV	2138.836	44.742
IP	7545.138	140.377

having long and slender palps (PaGe L/W > 2) and lacking semipectinalae on the palp genu. The latter group comprises also *Balaustium hernandezi* Mąkol et al., 2012. The most striking differences between these 2 species (except for characters which differentiate larvae) are expressed in the length of dorsal opisthosomal setae (23–46 in *B. leanderi* vs 45–75 in *B. hernandezi*) and in the PaGe L/W ratio (2.45–3.15 in DN and 3.06–3.63 in AD of *B. leanderi* vs 2.29 in DN and 2.7 in AD of *B. hernandezi*).

For several species known exclusively from active postlarval forms, the data on the PaGe L/W ratio and/or on the presence/absence of semipectinalae have not been described. The latter applies to the following species, from the circumtropical zone: *B. aonidiphagus* (Ebeling, 1934), *B. cristatum* Meyer & Ryke, 1959, *B. graminum* Meyer & Ryke, 1959, *B. medicagoense* Meyer & Ryke, 1959, *B. southcotti* Feider et Chioreanu, 1977. *Balaustium leanderi* differs from *B. aonidiphagus* in the body coloration, which in *B. aonidiphagus* is red but with greenish or bluish iridescence, from *B. cristatum* – in the number of AM setae in deutonymph (one seta in *B. cristatum*) and in PaGe L/W ratio (1.25 in *B. cristatum*, calculated from the drawing), from *B. graminum* – in the length of dorsal opisthosomal setae (22 in DN of *B. graminum*) and in PaGe L/W ratio (1.24 in *B. graminum*, calculated from the drawing), from *B. medicagoense* – in the lack of papillae-like structures on legs, from *B. southcotti* – in the length of the palp, excl. palp tarsus (203–261 in females of *B. southcotti*, 496–556 in females of *B. leanderi*).

The relatively wide range of morphometric data (Tables 1 and 2) observed in *B. leanderi*, not known for other *Balaustium* spp. poses a question on separate identity of species for which the minor differences in metric data served as the only source to distinguish the new taxon.

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