Three new species of Euplocania Enderlein (Psocodea, ‘Psocoptera’, Ptiloneuridae), for the state of Roraima, Brazil

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Abstract. The three new species of Brazilian Euplocania are described and illustrated, two species belong in the amabilis species group (Euplocania maraca sp. nov. and Euplocania ahr sp. nov.) and one species belong in the marginata species group (Euplocania macuxi sp. nov.). Information on species groups, species subgroups and distribution by Brazilian states is included for known species of Euplocania.

Keywords. Biodiversity; Epipsocetae; Neotropics; Taxonomy.

INTRODUCTION

Euplocania Enderlein (1910) is one of 12 recent genera in the psocopteran family Ptiloneuridae. It presently includes forty-seven described species, subdivided into 14 species groups. One of these fourteen Euplocania species groups is the amabilis species group, of García Aldrete et al. (2013), characterized by having forewings with broad, pigmented marginal band from R₂₊ to A and Cu₂ cells, pterostigma angulate, extended towards Rs, hypandrium of three sclerites, a large central sclerite, flanked by two small ones and central sclerite with two lateral posterior projections. It is the most specious species group of Euplocania with twenty-one species included (Silva-Neto et al., 2019).

Vinasco-Mondragón et al. (2018) based on the morphology of the hypandrium central sclerite and the mesal endophallic sclerite diagnosed six subgroups of species included in the amabilis group as follows: subgroup ariasii, subgroup badonneli, subgroup lasdelicias, subgroup manauensis, subgroup picta and subgroup tocatina. The most specious subgroup of the amabilis group is subgroup picta with seven species included: Euplocania bujarienensis Silva-Neto, García-Aldrete & Rafael, Euplocania caldasi Vinasco-Mondragón, González-Obando & García-Aldrete, Euplocania ecuatoriana Vinasco-Mondragón, González-Obando & García-Aldrete, Euplocania picta New, Euplocania pictaoides García-Aldrete, Euplocania pseudopictaoides Silva-Neto, García-Aldrete & Rafael and Euplocania vaupesiana Vinasco-Mondragón, González-Obando & García-Aldrete (Silva-Neto et al., 2019). The subgroup picta is characterized by having forewings pterostigma completely dark, projection angulated, postero-lateral processes of the central sclerite of hypandrium medium sized, bifurcated, forming an inverted V and mesal endophallic sclerite with median and usually postero-lateral process (Vinasco-Mondragón et al., 2018). Another subgroup of the amabilis group is subgroup manauensis with four species included: Euplocania cearensis Silva-Neto, García Aldrete & Rafel, Euplocania manauensis Vinasco-Mondragón, González & García Aldrete, Euplocania metensis Vinasco-Mondragón, González & García Aldrete and Euplocania rafaeli Vinasco-Mondragón, González & García Aldrete (Silva-Neto et al., 2019). It is characterized by having postero-lateral processes of the central sclerite of hypandrium anteriorly slightly or distinctly bulged, with rough thorns, posteriorly forming a short to medium sized projection, directed inwards, transverse mesal endophallic sclerite with well-developed mid posterior projection and external parameres with strong and sclerotized internal projection (Vinasco-Mondragón et al., 2018).

Another of these fourteen Euplocania species groups is the species group marginata, of García Aldrete et al. (2013), characterized by having...
forewing with pigmented marginal band from R₄–₅ to A and Cu2 cells, pterostigma rounded, not angulate nor extended towards Rs, hindwing with pigmented marginal band from R₃–₅ to A and Cu2 cells and hypandrium of three sclerites, central one large, with two medians, stout, acuminate posterior projections. Actually includes only three species: Euplocania marginata New & Thornton, Euplocania uariniensis Silva-Neto, García Aldrete & Rafael and Euplocania atlântica Silva-Neto, García Aldrete & Rafael. Three male specimens were available for study. They were dissected in 80% ethanol, and their parts were mounted on glass slides in Canada balsam. Standard measurements (in μm) were taken with a binocular micrometer. Abbreviations of parts measured are as follows: FW and HW: right fore- and hind-wing lengths; F, T, t₁, t₂ and t₃: lengths of femur, tibia and tarsomeres 1, 2 and 3 of right hind leg; f₁…fₙ: lengths of flagellomeres 1…n of right antenna; Mₓ₄: length of fourth segment of right maxillary palpus; IO: minimum distance between compound eyes in dorsal view of head; D and d: antero-posterior and transverse diameter, respectively, of right compound eye in dorsal view of head; PO: d/D. The specimens studied were stored in CD boxes, as described by Silva-Neto et al. (2016).

Photographs of the parts mounted were taken with a Leica DFC500 digital camera attached to a Leica M205C stereomicroscope, connected to a computer with the Leica Application Suite LAS V3.6 software, which includes an Auto-Montage module (Syncroscopy software). The types will be deposited in the Collection of the Instituto Nacional de Pesquisas da Amazônia, in Manaus, Amazonas, Brazil (INPA).

**RESULTS**

**Euplocania macuxi sp. nov.**

(Figs. 1-7)

**Male**

**Diagnosis:** Belonging in *marginata* species group of García Aldrete *et al.* (2013). Differing from the known species of this group, in having central sclerite of hypandrium almost straight anteriorly, posteriorly with a median...
Figures 1-7. *Euplocania macuxi* sp. nov. (Holotype male). (1) Front view of head. (2) Forewing. (3) Hindwing. (4) Lacinial tip. (5) Hypandrium. (6) Phallosome. (7) Clunium, right paraproct and epiproct. Scales in mm.
stout triangular process, underlaid by a stout bifid posterior process, with each arm machete shaped, widening posteriorly, distally curved slightly inwards; mesal sclerite of phallosome U-shaped, anteriorly convex, narrow, posteriorly widening with postero-lateral corners projected, these almost triangular, three pairs of endophallic sclerites, with an antero-lateral pair, boomerang shaped, almost the same width along its entire length and with a posterior pair, broad, trapeziform with sides converging to almost straight posterior border.

**Color (in 80% ethanol):** Compound eyes black, ocelli hyaline, with ochre centripetal crescents, head pattern (Fig. 1). Scape and pedicel brown, f1-f3 pale brown. Legs with coxae and trochanters brown, femora pale brown; tibiae proximally dark brown, then pale brown and dark brown distally; tarsomere 1 pale brown, tarsomeres 2-3 brown. Forewings veins brown, a wide, marginal pigmented band from R₄₋₅ to A1 and Cu2 cells, with a small, hyaline area on each side of vein ends, at wing margin, from M1 to M4; Rs and crossvein Rs-M dark brown. Pterostigma peripherally pale brown, with small irregular brown spots and with a transverse brown spot distally as a false vein (Fig. 2). Hindwings with a homogeneous brown band from R₄₋₅ to A1; veins brown (Fig. 3).

**Male**

**Diagnosis:** Belonging in species group *amabilis* of García Aldrete et al. (2013) and subgroup *manausensis* of Vinasco-Mondragón et al. (2018). Differing from the known species of this subgroup, in having postero-lateral processes of the central sclerite of hypandrium anteriorly distinctly bulged, not sinusous, leaving between them two small triangular projections, by having mesal endophallic sclerite with median process narrowing distally, almost triangular, with postero-lateral corners projected, these almost rectangular, posteriorly with a slight indentation each.

**Color (in 80% ethanol):** Compound eyes black, ocelli hyaline, with ochre centripetal crescents, head pattern (Fig. 8). Scape dark brown, pedicel yellow, f1 pale yellow. Mx4 yellow with apex dark brown. Legs with coxae, trochanters and femora brown, tibiae yellow with apex dark brown; tarsomere 1 yellow with end dark brown, tarsomeres 2-3 dark brown. Forewings veins brown, with a dark brown spot at wing margin, a marginal pigmented band from R₄₋₅ to A2 with two hyaline areas, boomerang shaped, on each side of the distal ends of the veins at wing margin; Rs and crossvein Rs-M dark brown, R₂₋₃ with a brown spot distally at wing margin. Pterostigma dark brown, with a hyaline window, almost elliptical at lower angle (Fig. 9). Hindwings (Fig. 10), almost hyaline, veins brown, each with a brown spot distally at wing margin.

**Morphology:** Compound eyes without interommatidial setae (Fig. 8). Outer cup of lacinial tip broad, with...
Figures 8-14. *Euplocania maraca* sp. nov. (Holotype male). (8) Front view of head. (9) Forewing. (10) Hindwing. (11) Lacinial tip. (12) Hypandrium. (13) Phallosome. (14) Clunium, right paraproct and epiproct. Scales in mm.
six denticles (Fig. 11). Forewing pterostigma angulate, almost triangular, areola postica tall, with round apex, slanted posteriorly, Rs stem almost straight, R₂ and R₅ sinuous; M stem slightly concave proximally, then almost straight, with four primary branches, M₁ straight, M₂-M₄ sinuous (Fig. 9). Hindwing Rs and R₂ straight, and R₅ convex in the middle, M sinuous (Fig. 10). Hypandrium of three sclerites, a large central sclerite with postero-lateral processes anteriorly distinctly bulged, not sinuous, leaving between them two small triangular projections; side sclerites large, broadly, posteriorly forked (Fig. 12). Phallosome (Fig. 13) with side struts basally fused, V-shaped, widening posteriorly and distally almost triangular. External parameres stout, K-shaped, with pores in outer arm. Two pairs of endophallic sclerites, antero-mesal pair strongly sclerotized, rounded basally, almost square posteriorly, with apex slightly forked; an antero-lateral pair stout, elongate, proximally wide, narrowing posteriorly, blunt ended. Epiproct wide basally, with sides converging to straight posterior border, three setae mesally, other setae as illustrated (Fig. 14). Paraprocts broad, wide basally, posteriorly narrowing at the end, with apex rounded, sensory fields with 30-31 trichobothria on basal rosettes, setae as illustrated (Fig. 14).

**Measurements (in microns):** FW: 4539, HW: 2915, F: 1342, T: 1846, t1: 712, t2: 98, t3: 149, f1: 528, Mx4: 320, IO: 645, D: 476 d: 327, PO: 0.68.

**Material examined:** Holotype male (INPA). BRAZIL. Roraima. Alto Alegre. Estação ecológica Maracá. 03°21’59”N, 61°26’04”W. 10-25.xii. 2015. Malaise grande. Rede Bia. R. Boldrini & J.A. Rafael.

**Etymology:** The specific epithet is given to this species as a noun in apposition and refers to the ecological station Maraca in Brazilian state of Roraima, where the holotype was collected.

**Euplocania ufrr sp. nov.** *(Figs. 15-21)*

**Male**

**Diagnosis:** Belonging in species group *amabilis*, of García Aldrete *et al.* (2013) and subgroup picta, of Vinasco-Mondragón *et al.* (2018). It is close to *E. bujariensis* in the general shape of the hypandrium, especially by having postero-lateral processes of the central sclerite of hypandrium as long as its antero-posterior length, instead the anteroposterior length of the basal part of the hypandrium two or three times longer than the length of its postero-lateral processes as occurs in the other six species included in this subgroup and by having the lateral posterior projections of the hypandrium with the apex of the inner margin not acuminate. Differing from *E. bujariensis* by having pterostigma without a small hyaline window at lower angle, by having basal part of the hypandrium semi oval instead of sub square as in *E. bujariensis*, by having distal part of postero-lateral processes of the hypandrium about three times longer than it is wide, rather than just twice as long as it is wide as in *E. bujariensis*, and by having mesal endophallic sclerite without postero-lateral processes, with median process widening distally (compare Figs. 16, 19 and 20 in this paper with figs. 2, 6 and 7 in Silva-Neto *et al.*, 2019).

**Color (in 80% ethanol):** Compound eyes black, ocelli hyaline, with ochre centripetal crescents, head pattern (Fig. 15). Scape and pedicel dark brown, f1-f3 yellow. Mx4 yellow with apex brown. Legs with coxae, trochanter and femora pale yellow, tibiae pale brown, with apex dark brown; tarsomere 1 yellow, tarsomeres 2-3 dark brown. Forewing veins brown, with a dark brown spot at wing margin; a marginal pigmented band from R₅ to A2 with two hyaline areas, boomerang shaped, on each side of veins, distally at wing margin, from R₅, to Cu1a; Rs and crossvein Rs-M dark brown. Pterostigma completely dark brown (Fig. 16). Hindwings (Fig. 17), almost hyaline, veins brown, each with a brown spot distally at wing margin.

**Morphology:** Head with vertex concave in the middle, slightly above the level of the upper border of the compound eyes, these without interommatidial setae (Fig. 15). Outer cusp of lacinial tip broad, with five denticles (Fig. 18). Forewing pterostigma angulate, projected in the middle towards Rs, areola postica tall, with round apex; Rs stem almost straight, R₂ and R₅ sinuous; M stem slightly concave proximally, then almost straight, with four primary branches, M₁ almost straight, M₂-M₄ sinuous (Fig. 16). Hindwing Rs straight, R₂ straight, R₅ slightly concave proximally, then almost straight, M stem sinuous (Fig. 17). Hypandrium of three sclerites, a large central sclerite, basally semi-oval, with a small acuminate projection on each side, anterior to each postero-lateral processes, these last with distal part about three times longer than it is wide, with the apex of the inner margin not acuminate, setae as illustrated (Fig. 19). Phallosome (Fig. 20) with side struts basally fused, V-shaped, widening in the middle and narrowing at the ends, distally curved inwards. External parameres U-shaped with a field of pores in the middle. Mesal sclerite wide, strongly sclerotized, tripartite into three equal parts, transversely y-shaped, with a central projection in the middle, widening at the end. Two pairs of endophallic sclerites, an antero-mesal pair fused in the middle of the phallosome, giving rise to a type of second mesal sclerite, anteriorly wide, triangular, posteriorly narrowing, V-shaped, ending in the possible fusion zone, it with a small acuminate projection; an antero-lateral pair wide basally, with sides narrowing posteriorly, with apex truncate. Epiproct wide basally, with sides converging to triangular posterior border, three setae mesally, other setae as illustrated (Fig. 21). Paraprocts broad, wide basally, posteriorly narrowing at the end, with apex straight, sensory fields with 30-31 trichobothria on basal rosettes, setae as illustrated (Fig. 21).
Figures 15-21. *Euplocania ufrr* sp. nov. (Holotype male). (15) Front view of head. (16) Forewing. (17) Hindwing. (18) Lacinial tip. (19) Hypandrium. (20) Phallosome. (21) Clunium, left paraproct and epiproct. Scales in mm.
Measurements (in microns): FW: 4848, HW: 3285, F: 1422, T: 2041, t1: 837, t2: 95, t3: 179, f1: 845, f2: 804 f3: 710, Mx4: 325, IO: 537, D: 550 d: 372, PO: 0.67.

Material examined: Holotype male (INPA). BRAZIL. Roraima. Amajari. Tepequém. Sesc. Igarapé Cocal. 03°45‘12.00″N, 61°42‘42.00″W. Pensilvânia. 03-05.x.2020. Boldrini, Oliveira & Pereira.

Etymology: The specific epithet is an invariable combination of letters in apposition, corresponding to the acronym of the Universidade Federal de Roraima (UFRR), an emblematic educational and research institution of the state of Roraima.

DISCUSSION

The three *Euplocania* species here described raise to 50 the number of species in the genus, and raise to 19 the species recorded in Brazil (38% of the total), two of them (*E. badonneli* New & Thornton and *E. cerata* New) shared with Peru, and one (*E. cerata* New) shared with Colombia; the rest are possibly endemic to Brazil (Table 1). Among the regions of Brazil, the Northern region is the most diverse in *Euplocania* species (fifteen species) with the state of Amazonas represented by six species (Table 1). The three new species of *Euplocania* described in this paper, are the northernmost record in Brazil for *Euplocania* and the first record of this genus in the Brazilian state of Roraima.

The *Marginata* species group is diagnosed by characteristics of the wings and by characteristics of hypandrium (see diagnose above). However, as mentioned by Silva-Neto (2021), the authors García Aldrete et al. (2013) illustrated the hypandrium and the forewing of the unknown male of *E. marginata* (see figs. 16, 17 in García Aldrete et al., 2013), but the authors did not provide a taxonomic description of this male. In this way the phallosome and other morphological details of the *E. marginata* male remains unknown. Despite the lack of knowledge about the phallosome of the *E. marginata*, *Euplocania macuxi* sp. nov. easily differs from it and all other species of the *marginata* group by having an autopomorphic hypandrium as described in its diagnosis.

Future phylogenetic studies, using morphological and molecular data will be necessary to test the monophyly of these groups and subgroups and to understand the *Euplocania* evolution.

AUTHORS’ CONTRIBUTIONS: AFP, AMSN, RB: Conceptualization, Writing – review & editing; AFP, AMSN: Methodology, Formal analysis, Writing – original draft, Visualization, Investigation; RB: Funding acquisition; AMS, RB: Supervision. All authors actively participated in the discussion of the results, they reviewed and approved the final version of the paper.

CONFLICTS OF INTEREST: Authors declare there are no conflicts of interest.

FUNDING INFORMATION: Project Rede Bionorte: Biodiversidade de insetos na Amazônia. Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001. Fundação de Amparo à Pesquisa do Estado do Amazonas (FAPEAM) – POSGRAD/scholarship. Conselho Nacional de Desenvolvimento Científico e Tecnológico of Brazil (CNPq) for PCI-DB research grant (Process: 317785/2021-4). PIBIC-CNPq research grant (SEI Process: 146985/2021-4).

ACKNOWLEDGMENTS: AMSN thanks Instituto Nacional de Pesquisas da Amazônia (INPA). RB and AFP thanks Universidade Federal de Roraima.

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