

# On *Loneura crenata* Navás and *Loneura ocotensis* García Aldrete (Psocodea, 'Psocoptera', Ptiloneuridae)

Marcelo Cutrim<sup>1,3</sup>; Alberto Moreira da Silva-Neto<sup>1,4</sup>; Alfonso N. García-Aldrete<sup>2,5</sup> & José Albertino Rafael<sup>1,6</sup>

<sup>1</sup> Instituto Nacional de Pesquisas da Amazônia (INPA), Programa de Pós-Graduação em Entomologia. Manaus, AM, Brasil.

<sup>2</sup> Universidad Nacional Autónoma de México (UNAM), Instituto de Biología, Departamento de Zoología, Laboratorio de Zoología. México, D.F., México.

<sup>3</sup> ORCID: <http://orcid.org/0000-0001-7147-5300>. E-mail: [marcelocutrim@gmail.com](mailto:marcelocutrim@gmail.com) (corresponding author)

<sup>4</sup> ORCID: <http://orcid.org/0000-0002-4522-3756>. E-mail: [bio.alberto@gmail.com](mailto:bio.alberto@gmail.com)

<sup>5</sup> ORCID: <http://orcid.org/0000-0001-7214-7966>. E-mail: [anga@ib.unam.mx](mailto:anga@ib.unam.mx)

<sup>6</sup> ORCID: <http://orcid.org/0000-0002-0170-0514>. E-mail: [jarafael@inpa.gov.br](mailto:jarafael@inpa.gov.br)

**Abstract.** Here it is shown that *Loneura crenata* Navás, 1927 and *Loneura ocotensis* García Aldrete are distinct species, so the previously proposed synonymy of the latter with the first is not valid. Illustrations of the *L. crenata* holotype, deposited in the Hamburg University Zoological Museum, are here presented for the first time.

**Keywords.** Epipsocetae; Psocids; Neotropics; Taxonomy; Synonymy.

## INTRODUCTION

The Costa Rican species *Loneura crenata* Navás, 1927 is the type species of *Loneura* Navás. The description, in Latin, refers to the body's color and length, as well as the fore- and hind- wings' length and venation. The fore- and hind- wings are illustrated, the first shows a submarginal pigmented band from vein R<sub>4+5</sub> to the areola postica, which is tall, broadly triangular, and slightly slanted posteriorly. The pterostigma is subtriangular, semioval, with vein R<sub>1</sub> well pigmented, the stems of veins R<sub>s</sub> and M are straight, and vein M is six-branched (Fig. 1). The hindwing is unpigmented, with vein M four-branched (Fig. 2). Although is not indicated in the description, the holotype is a male, dry mounted, *i.e.*, it is deposited in the Centrum für Naturkunde, of the Hamburg University Zoological Museum (M. Huseman, 2020, *in litt.*) (Figs. 7-10). Later, New (1976) reports that there are also three male paratypes in the same collection and, based on the most complete paratype, redescribed and illustrated the species (Figs. 1-2, 3-6). Here we highlight that these three specimens of *L. crenata*, considered as paratypes by New (1976) do not have the status of paratypes because they are not mentioned in the original description by Navás (1927) and are therefore non-type specimen from the type locality.

*Loneura crenata* Navás belongs to the species group I, subgroup IA, defined by García Aldrete

*et al.* (2011). It is related to the Mexican *L. leonilae* García Aldrete, 1995, from which it differs in the number of forewing M branches (6 and 5, respectively), hindwing M branches (4 and 3, respectively), in the central sclerite of the hypandrium having one triangular flap distally on the posterior process, missing in *L. leonilae*, in having the posterior border of the posterior process of the central sclerite of the hypandrium slightly concave (decidedly pointed in *L. leonilae*), and in the phallosome's endophallic sclerites [compare fig. 5 with fig. 6 in García Aldrete (1995)]. *L. crenata* is also related to the Nicaraguan *L. mombachensis* García Aldrete, 2003, and despite having the same six M branches on the forewing, differs by lacking a pigmented band from R<sub>4+5</sub> to the areola postica in the forewings, from the middle of Cu<sub>1</sub>A to the wing margin, by lacking distal dilated sides in the central sclerite of the hypandrium, and by the phallosome's endophallic sclerites [see Figs. 11 (wings), 16 (hypandrium), and 17 (phallosome) in García Aldrete (2003)].

*Loneura crenata* and *L. ocotensis* García Aldrete are remarkably similar in having fore- and hindwings, with the same M terminal branches (6 and 4, respectively), the head's same color pattern, hypandrium with central projection distally acuminate, phallosome with the same shape on the side strut and external parameres, and the endophallic sclerites' same shape and number. Based on the abovementioned, Castro (2007), in an un-

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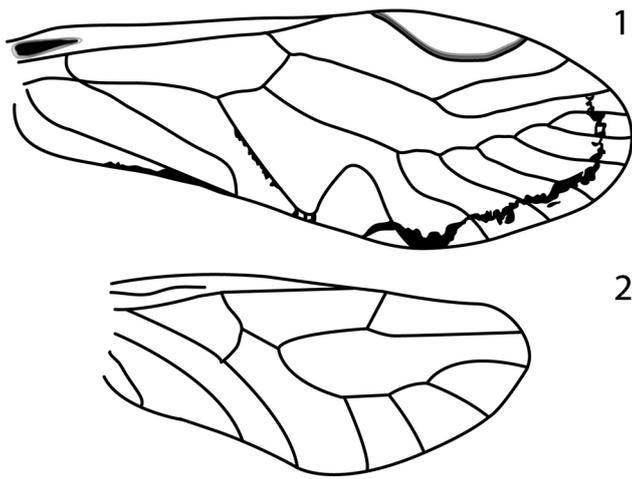
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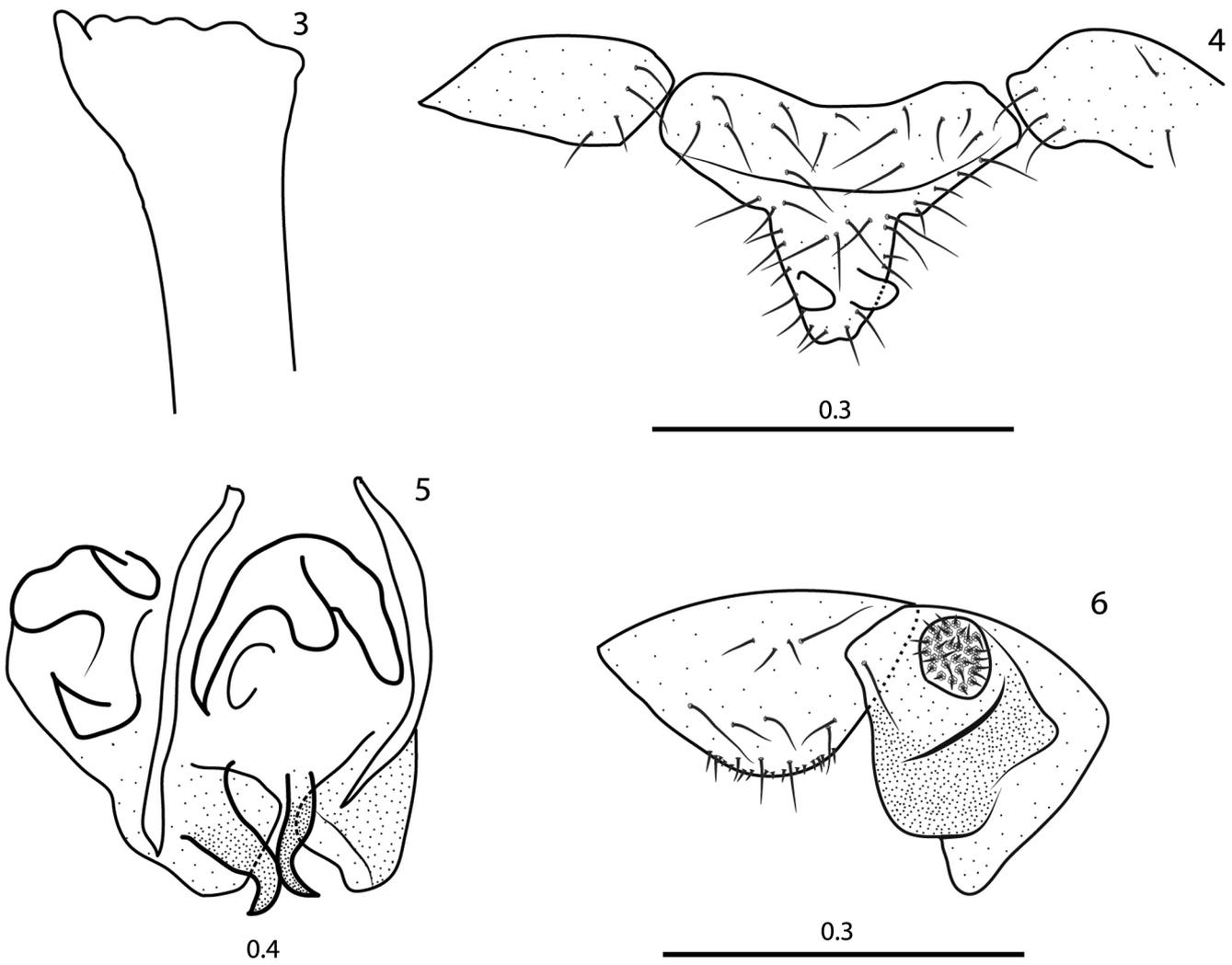
**Figures 1-2.** *Loneura crenata* Navás. Male holotype. (1) Forewing. (2) Hindwing. Redrawn by García Aldrete et al. (2020) from the original description by Navás (1927).

published master's thesis conducted at the Instituto Nacional de Pesquisas da Amazônia, in Manaus, Brazil, established that *L. ocotensis* was a synonym of *L. crenata*. Then, this was mentioned by González Obando et al.

(2020). One of the most important facts that explained and suggested these species' synonym is that both species have six M terminal branches in the forewing, but in *L. crenata* all six branches are primary, while in *L. ocotensis* only four branches are primary and the fifth is bifurcated.

Previous taxonomic works related to *Loneura*, like those of Navás (1927) and New (1976), were based on characters such as the number of branches with venation, which was considered invariable and only the terminal branches were considered disregarding the primary branches. The wing color pattern, head color, and morphology of the genitalia's structures was simply described and little studied. Now, with the increase in the number of species and specimens, we know that the head color and the number of veins, due to having great intraspecific variation, are no longer safe characters to separate *Loneura* species. The genitalia morphology is more informative, it has very well-defined patterns and it has been shown to be the best character to safely separate this genus' species.

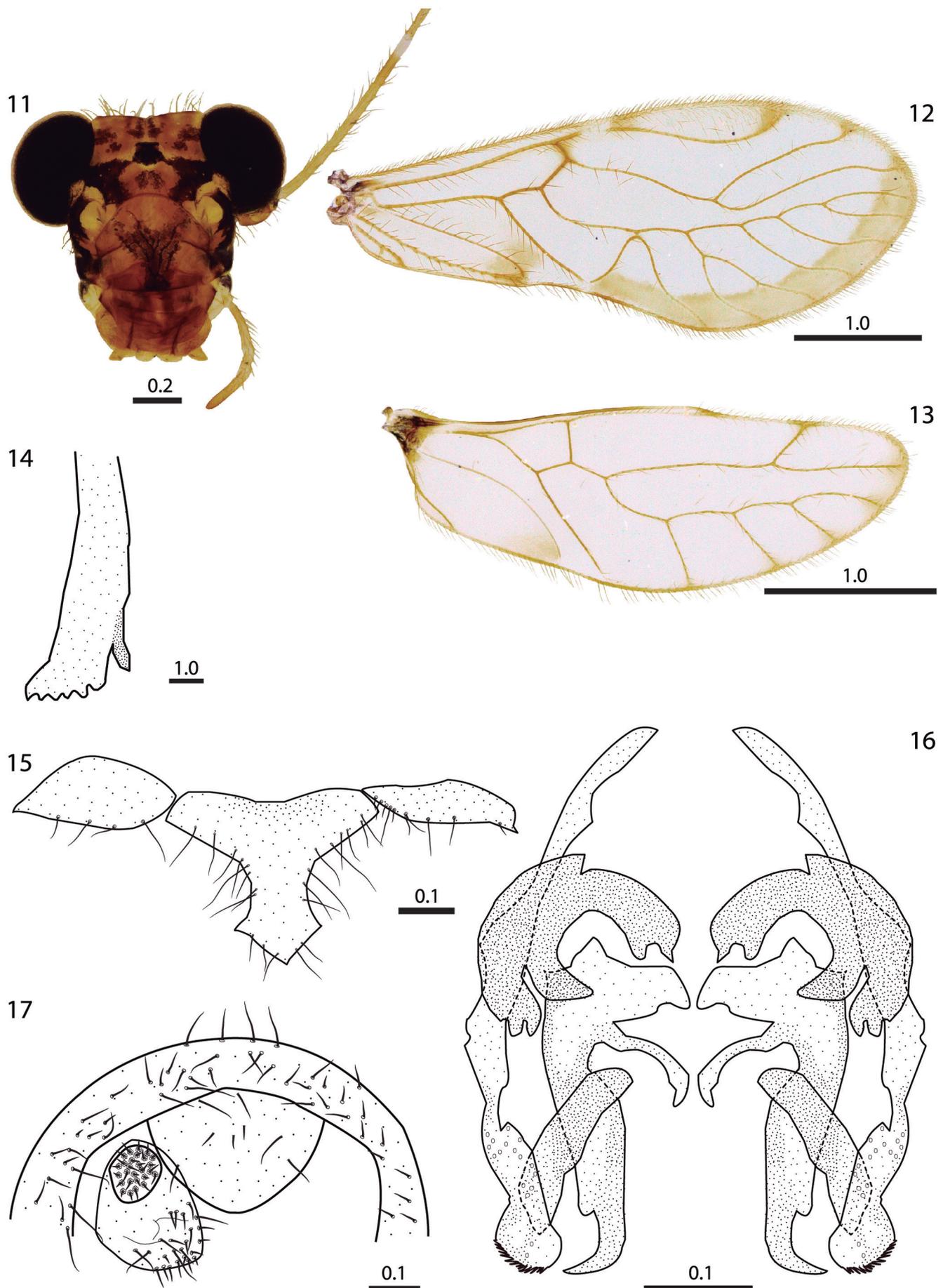
The purpose of this paper is to present details on genitalia morphology and illustration of the *L. ocotensis* male holotype to investigate the synonym with *L. cren-*



**Figures 3-6.** *Loneura crenata* Navás. Male paratype. (3) Lacinial tip. (4) Hypandrium. (5) Phallosome. (6) Epiproct and Paraproct. Rearranged from original illustrations by New (1976). Scales in mm (Fig. 3 without scale).



Figures 7-10. *Loneura crenata* Navás. Male holotype. (7) Side view. (8) Front view. (9) Dorsal view. (10) Holotype labels.



**Figures 11-17.** *Loneura ocotensis* García Aldrete. Male holotype (11) Anterior view of head. (12) Forewing. (13) Hindwing. (14) Lacinial tip. (15) Hypandrium. (16) Phallosome. (17) Clunium, left paraproct and epiproct. Scales in mm.

*ata*, which, for being the type species of the genus and being inserted in this dubious synonym, was bringing uncertainty to the taxonomy of the genus.

## MATERIAL AND METHODS

Three *L. ocotensis* males were available on loan from García Aldrete (UNAM) for study. They were dissected in 80% ethanol, and their parts were mounted on glass slides in Canada balsam. Standard measurements (in  $\mu\text{m}$ ) were taken with a filar 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 head dorsal view; D and d: antero-posterior and transverse diameter, respectively, of right compound eye in head dorsal view; PO: d/D. The final storage of the specimens was 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).

## RESULTS

The decision to synonymize *L. ocotensis* with *L. crenata* is wrong. After analyzing more specimens, we have found that the two species, although related, are distinct and differ as follows:

- In the posterior process of the central sclerite of the hypandrium of *L. ocotensis*, the sides are parallel; distally, the process has a pointed projection on each side, and the apex is obtusely convex (Fig. 15). In *L. crenata*, the posterior process of the central sclerite of the hypandrium has sides not parallel, slightly converging to a slightly obtusely concave apex, it has, subapically, a triangular flap on each side of the longitudinal midline (Fig. 4).
- In *L. ocotensis*, the distal fourth of the posterior endophallic sclerites of the phallosome is distinctly narrowed, while in *L. crenata* the distal fourth of the posterior endophallic sclerites is continuous with the rest of the sclerite. Likewise, and as far as it can be observed, the anterior endophallic sclerites are quite different (compare the phallosome (Fig. 5) illustrated by New (1976) with the phallosome (Fig. 16) of *L. ocotensis* in this paper).

The observations above suggest that *L. crenata* Navás and *L. ocotensis* García Aldrete are different species, therefore, the synonymy proposed by Castro (2007) and reported by González Obando *et al.* (2020) has to be rejected.

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## AUTHORS' CONTRIBUTIONS

M.C., A.N.G.A. and A.M.S.N. analyzed the morphological characters of the species. M.C. prepared the figures. M.C., A.M.S.N., A.N.G.A. and J.A.R. wrote the manuscript.

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