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Two new species of *Epipsocus* Hagen, with forewing vein M3 forked (Psocodea: Psocomorpha: Epipsocidae)

Dos nuevas especies de *Epipsocus* Hagen, con la vena M3 de la ala anterior bifurcada (Psocodea: Psocomorpha: Epipsocidae)

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ABSTRACT

Two species of *Epipsocus* Hagen, one from Costa Rica and the other from Mexico, are here described and illustrated; they are apomorphic, in having the forewing M dichotomously branched, thus differing from the pattern of caeciliusid venation of most of the species of *Epipsocus*. Other forewing venation anomalies in *Epipsocus* are presented.
Key words: 'Psocoptera', taxonomy, wing venation anomalies, Costa Rica, Mexico.

RESUMEN

Dos especies de *Epipsocus* Hagen, una de Costa Rica y la otra de México, son aquí descritas e ilustradas: son apomórficas, por tener la vena M del ala anterior dicotómicamente ramificada, en lo que difieren del patrón de venación caeciliúsida de la mayoría de las especies de *Epipsocus*. Se presentan también otras anomalías en la venación de las alas anteriores de *Epipsocus*.
Palabras clave: 'Psocoptera', taxonomía, anomalías de venación, Costa Rica, México.

Most of the known species of *Epipsocus* Hagen (see Lienhard & Smithers, 2002; Psocodea.speciesfile.org), have caeciliusid wing venation (forewing Rs of two branches, M three branched, hindwing Rs of two branches, M unbranched), this being the plesiomorphic condition in the genus (see below, under Discussion).

I take here the opportunity to comment on some of the described species of *Epipsocus*: *E. africanus* Smithers, and *E. rhabdolepis* Li, according to their phallosomes, do not belong in *Epipsocus*, as defined by Mockford (1998); *E. argentinus* Badonnel, was described on basis of a larva, and thus it lacks information on wing venation; *E. fasciicornis* Okamoto is a pseudocaeciliid (Yoshizawa, *in litt*., 2003). *E. hageni* Banks, and *E. marginatus* Enderlein, have been categorized as *incerta sedis* by Mockford (1998), *E. pinnatus* Enderlein, and *E. viiv* Enderlein are not clearly assignable in *Epipsocus,* and there is no information on wing venation in *E. euryocephalus* Li, *E. scotothoracalis* Li, *E. spatulatus* Li, *E. stictus* Li, and *E. xanthotoracalis* Li.

I describe in this paper two species of *Epipsocus* that have the forewing M dichotomously branched (with M3 forked); one is from Guanacaste, Costa Rica, and the other is from the Chimalapas area, in Oaxaca, Mexico. They are assigned in *Epipsocus* because the male has the phallosome typical of the genus, and because the female gonapophyses have v1, that lacks in *Mesepipsocus*, the sister genus to *Epipsocus* (Casasola González, 2006; Casasola González & García Aldrete, 2002).

MATERIAL AND METHODS

One female of the Costa Rican species, and two males and one female of the Mexican species were available for study. All the specimens were dissected in 80% ethanol, and their parts (heads, right wings and legs, and genitalia), were mounted on slides in Canada balsam, following standard procedures. Parts on the slides were measured with a filar micrometer; abbreviations of parts measured are the following: FW, HW: lengths of right fore- and hind- wings, F, T, t1, t2: lengths of femur, tibia and tarsomeres 1 and 2 of right hind leg, ctt1: number of ctenidobothria on t1, Mx4: length of fourth palpomere of right maxillary palpus, f1…fn: lengths of flagellomeres 1…n of right antenna, IO, D and d: minimum distance between compound eyes, antero-posterior diameter, and transverse diameter, respectively, of right compound eye, on dorsal view of head. PO: d/D. The types are deposited in the National Collection of Insects (CNIN), Zoology Department, Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City.

RESULTS

Family Epipsocidae Pearman
Genus *Epipsocus* Hagen
Epipsocus moroni **n. sp.** Female
(Figs 1-5)
http://zoobank.org/147EC14A-F364-477F-B9EE-947CA1AA3840

Diagnosis. Differing from the described species of *Epipsocus,* in having the forewing M dichotomously branched (M3 forked).

Color (in 80% ethanol). Body pale brown. Compound eyes black, ocelli hyaline, without centripetal pigmented crescents. Wings (Fig. 1) almost hyaline, pale brown, with veins dark brown; forewing: pterostigma with an anterior dark brown band, a dark spot at distal end of veins, and at confluence of Cu2-A. Abdomen whitish, with brown subcuticular rings, less pigmented ventrally.

Morphology. Outer cusp of lacinial tip broad, with six denticles (Fig. 2). Forewing pterostigma long, narrow

anteriorly, wider in the middle; R2+3 and R4+5 flexuous, longer than Rs; M with M3 branched. Areola postica low, apically rounded, four times as wide as tall (Fig. 1). Subgenital plate broad, setose, slightly projected posteriorly in the middle, pigmented area concave anteriorly (Fig. 3). Gonapophyses: v1 long, slender, acuminate, v2+3 with a stout, blunt ended heel anteriorly, v3 a distinct, elongate lobe on side of v2, bearing 8-9 long setae, distal process anteriorly dilated, long, slender, pointed, with a field of microspines anteriorly (Fig. 5). Ninth sternum unpigmented (Fig. 5). Paraprocts (Fig. 4) broad, almost semicircular, setose, with elliptic sensory fields bearing 26-27 trichobothria on basal rosettes. Epiproct (Fig. 4) wide, rounded posteriorly, with a dense field of setae posteriorly, a field of microspines on anterior border of distal third, three long setae mesally on proximal third, other setae as illustrated.

Measurements. FW: 1712, HW: 1334, F: 1010, T: 1624, f1: 739, IO: 498, D: 345, d: 203, IO/d: 2.45, PO: 0.58.

Type locality. Holotype female. COSTA RICA. Guanacaste Province. Punta Santa Elena. Cloud Forest Reserve, 1700 m. 8.IX.1998. Charles W. and Lois B. O'Brien.

Etymology. This species is dedicated, *in memoriam*, to Dr. Miguel Ángel Morón Ríos, in recognition to his vast and important contributions to the study of Scarabeoidea, at the Instituto de Ecología A. C., in Jalapa, Veracruz, Mexico.

Epipsocus reyesi **n. sp.**
(Figs 6-13)
http://zoobank.org/004AFD13-0972-4DCD-8F80-DD2333D06F49

Diagnosis. It differs from *E. moroni* **n. sp.**, in having the forewing pterostigma less elongate, in having the subgenital plate with sides converging to the apex, with the pigmented area less concave anteriorly, and in having the anterior heel of v2+3 longer, slender and distally acuminate.

Male. Color (in 80% ethanol). Body reddish brown. Compound eyes black, ocelli hyaline, with ochre centripetal crescents. Head pattern (Fig. 8). Maxillary palps, antennae and legs brown. Wings hyaline, with a slight reddish hue. Forewing pterostigma with a proximal and a distal brown band. Veins brown, with a brown spot at wing margin. Abdomen whitish, with dark brown, transverse subcuticular bands on tergum, sternum almost unpigmented.

Morphology. Outer cusp of lacinial tip broad, with five-six denticles. Forewing venation (Fig. 6), M dichotomously branched, areola postica low, elongate. Hindwing (Fig. 6). Hypandrium wide, setose, posteriorly straight, with a field of macrosetae on each corner (Fig. 8). Phallosome (Fig. 11), with posterior projection of aedeagal arch wide, endophallus membranous. Paraprocts (Fig. 7), broad, with setae as illustrated, sensory fields elliptic, bearing 26-28 setae on basal rosettes. Epiproct (Fig. 7) trapeziform, with three macrosetae next to anterior border, a row of three large setae along posterior border, and a field of setae mesally and postero-laterally.

Measurements. FW: 4180, HW: 2992, F: 382, T: 692, t1: 318, t2: 90, t3: ctt1: 33, Mx4: 251, f1: 1110, f2: 1031, f3: 799, IO: 294, D: 337, d: 225, IO/d: 1.30, PO: 0.66.

Female. Color (in 80% ethanol). Same as the male.

Morphology. Outer cusp of lacinial tip and wing venation as in the male. Subgenital plate (Fig. 10) broadly triangular, setose, with the apex rounded, pigmented area concave anteriorly. Gonapophyses (Fig. 12): v1 long, slender, acuminate; v2+3 anteriorly with a long, slender, sclerotized heel, v3 an elongate, distinct lobe on v2, bearing a field of 8-10 long setae, distal process anteriorly dilated, posteriorly slender, acuminate, both covered with microsetae, ninth sternum unpigmented, membranous, with spermapore located posteriorly. Paraprocts (Fig. 13), broad, setose, sensory fields elliptic, with 29-30 trichobothria on basal rosettes. Epiproct (Fig. 13) trapeziform, with three mesal macrosetae next to anterior border, a field of mesal and postero-lateral setae, and a row of long setae along posterior border.

Measurements. FW: 4357, HW: 3141, F: 399, T: 689, t1: 321, t2: 94, t3: ctt1: 33, f1: 975, f2: 1033, f3: 784, IO: 392, D: 312, d: 212, IO/d: 1.84, PO: 0.67.

Type locality. Holotype male. MEXICO. Oaxaca. 4 km N of Díaz Ordaz, San Miguel Chimalapa, 16º44.026'N: 94º11.975'W. 1512 m. 20.X.2003. On rock wall with abundant lichens. J. A. Casasola González. Paratypes: 1 male, 1 female. Same data as the holotype.

Etymology. This species is dedicated *in memoriam*, to Dr. Pedro Reyes Castillo, of the Instituto de Ecología, A. C., of Jalapa, Veracruz, Mexico, who devoted his life to the study of Passalidae, area in which his many contributions are seminal.

DISCUSSION

The type species of *Epipsocus*, *E. avus* (Roesler), from Tertiary amber (see Enderlein, 1911), has the wing venation caeciliusid, this being the plesiomorphic condition, found in most of the recent species of *Epipsocus*. Two species deviate from this pattern: *E. fuscareolatus* New, from the Reserva Florestal Ducke, near Manaus, Amazonas, Brazil, has the forewing Rs of three branches, and M of four branches, not dichotomously divided (see New, 1980); *E. opticus* New & Thornton, from The Peruvian Río Tambopata Reserve, also within the Amazon Basin, has the forewing M of four branches, not dichotomously divided (see New & Thornton, 1988).

The two species here described, have the forewing M dichotomously branched (with M3 forked) representing an apomorphic condition in *Epipsocus*, this pattern of venation is common in species of *Mesepipsocus* Badonnel, also observed in species of *Edmockfordia* García Aldrete, *Mesepipsocoides* García Aldrete & Casasola González, and in the ptiloneurid genus *Triplocania* Roesler (see Silva-Neto *et al.,* 2014; González Obando *et al.,* 2017).

In undescribed species of *Epipsocus*, the following wing venation anomalies have been observed (Figs 14-19): forewing venation caeciliusid, vein stubs as illustrated, with crossvein areola postica-M (Fig. 14. ECUADOR. Napo. Waorani Ethnic Reserve, male), forewing M dichotomously branched, vein stubs on R2+3 and R4+5 (Fig. 15. ECUADOR. Napo. Waorani Ethnic Reserve, female), forewing Rs three-branched, M three branched (Fig. 16. BRAZIL. Amazonas. Río Purus, male), forewing Rs unbranched, M of four branches (Fig. 17. BRAZIL. Pará. Oriximiná. Río Trombetas, male), forewing Rs of five branches, a crossvein joining Rs and pterostigma, M five-branched (Fig. 18. BRAZIL. Amazonas. Manaus. University Campus, female), forewing Rs three branched,

M five branched [M3 three branched] (Fig. 19. ECUADOR. Napo. Waorani Ethnic Reserve, female).

E. moroni García Aldrete is the first species of *Epipsocus* recorded in Costa Rica, and *E. reyesi* García Aldrete is the third species of *Epipsocus* recorded in Mexico, together with *E. bullocki* García Aldrete, and *E. petenensis* Mockford. These two species raise to 39 the number of the species in the genus, not considering in it the species *E. africanus* Smithers, *E. fasciicornis* Okamoto and *E. rhabdolepis* Li. Since a major difference between *Epipsocus* and *Mesepipsocus* is the lack of v1 in the latter, it is likely that some of the species known only from males in *Epipsocus* may belong in *Mesepipsocus* (*e.g. E. acanthus* New, *E. argutus* New, *E. atratus* New, *E. badonneli* Mockford, *E. beguiristaini* Williner, *E. blandus* New & Thornton, *E. foliatus* Mockford, *E. fuscareolatus* New, *E. maculithorax* New, *E. opticus* New & Thornton, *E. pennyi* New, *E. pereirai* Badonnel, *E. phaeus* New, *E. roraimensis* Mockford, *E. serenus* Roesler, *E. stigmaticus* Mockford, and *E. verrucosus* New).

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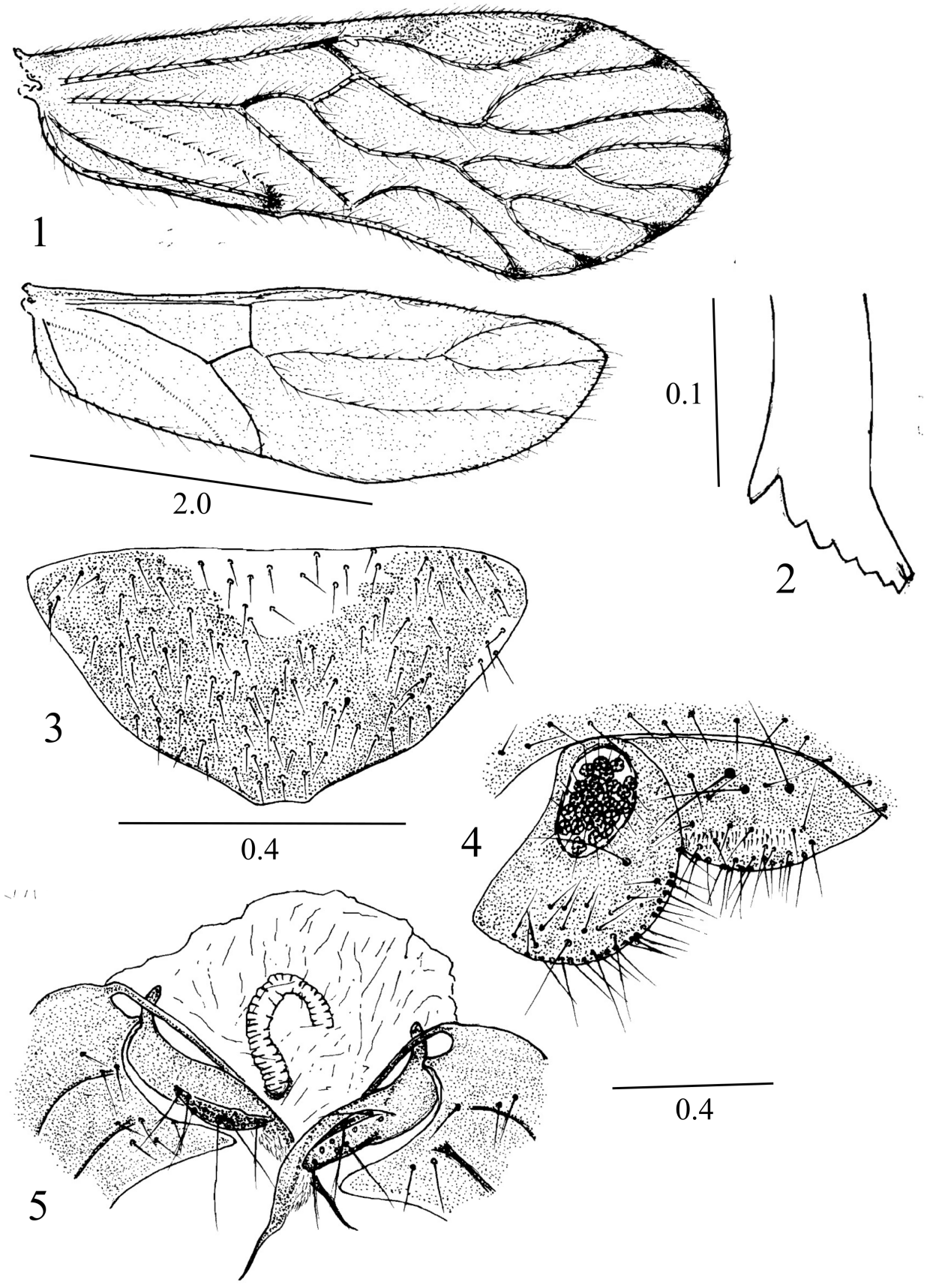
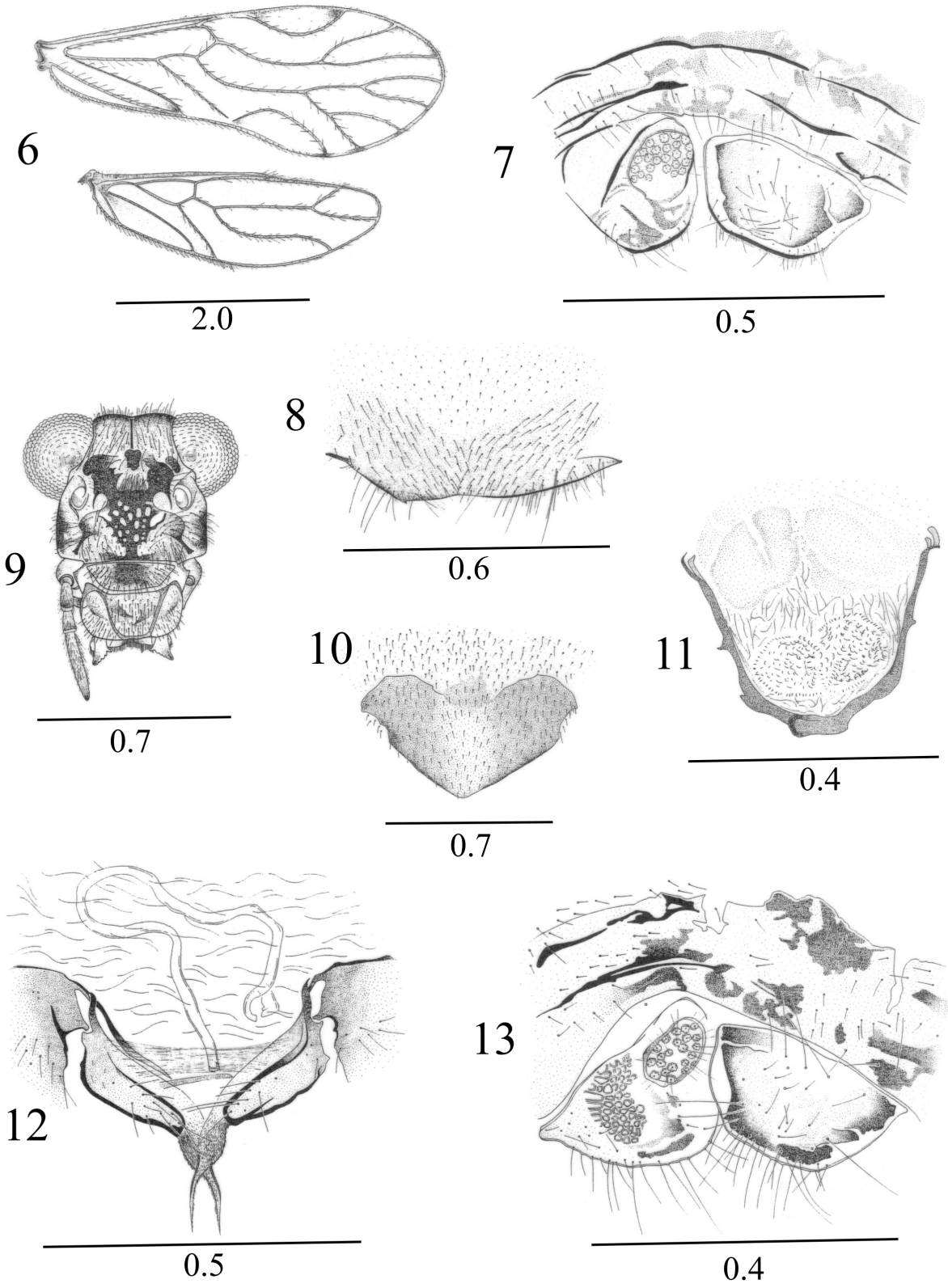
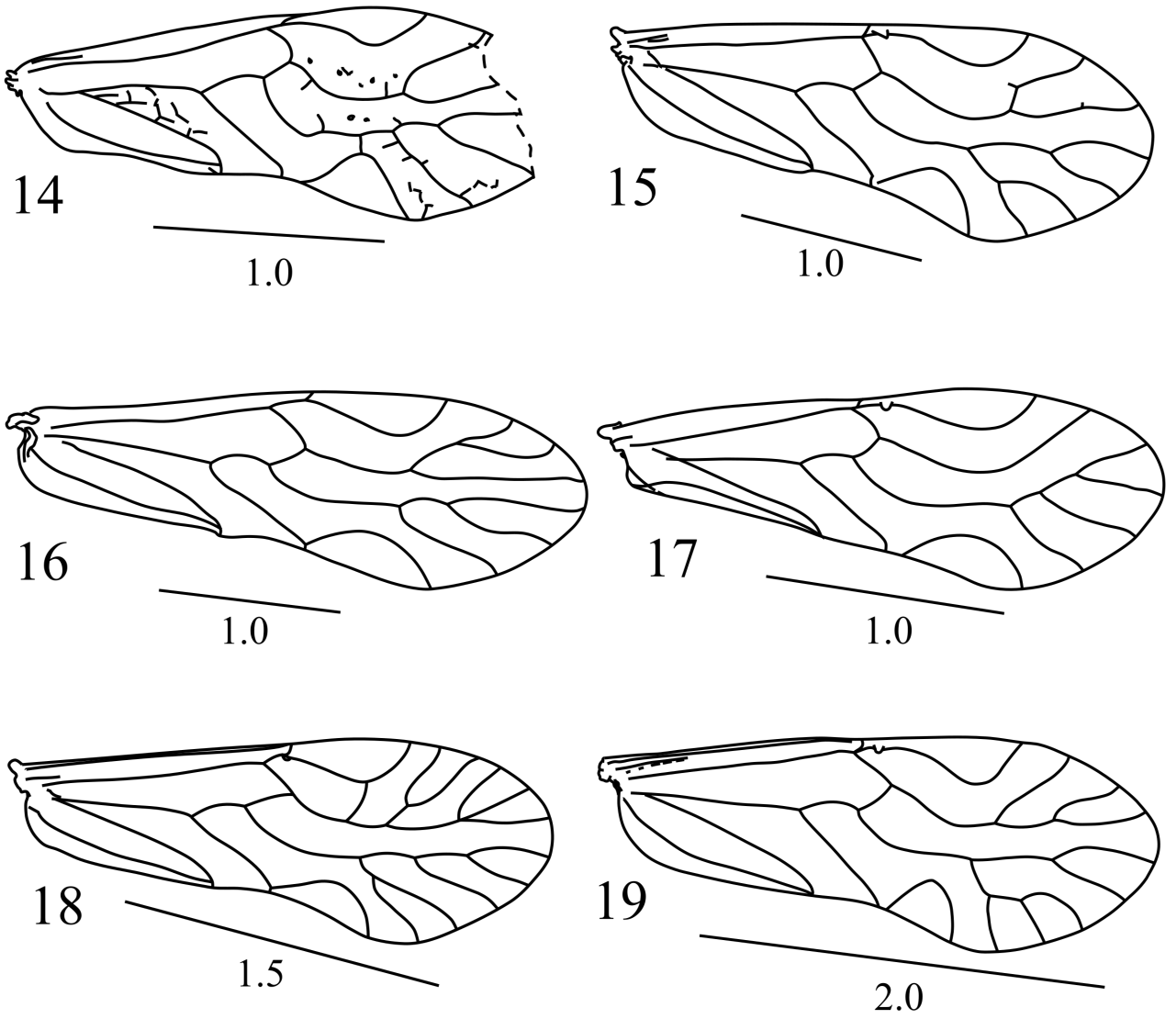


Figures 1-5. *Epipsocus moroni* **n. sp.** 1. Fore- and hind- wings. 2. Lacinial tip. 3. Subgenital plate. 4. Left paraproct and epiproct. 5. Gonapophyses and ninth sternum. Scales in mm. Figs 4 and 5 to common scale.



Figures 6-13. *Epipsocus reyesi* **n. sp.** 6. Fore- and hind- wings. Male. 7. Clunium, left paraproct and epiproct. Male. 8. Hypandrium. Male. 9. Front view of head. Male. 10. Subgenital plate. Female. 11. Phallosome. Male. 12. Gonapophyses and ninth sternum. Female. 13. Clunium, left paraproct and epiproct. Female. Scales in mm.



Figures 14-19. Anomalies in the forewing venation of *Epipsocus* spp. 14. Forewing venation caeciliusid, vein stubs as illustrated, crossvein areola postica-M (ECUADOR. Napo. Waorani Ethnic Reserve, male). 15. Forewing M dichotomously branched, vein stubs on R2+3 and R4+5 (ECUADOR. Napo. Waorani Ethnic Reserve, female). 16. Forewing Rs three-branched, M three-branched (BRAZIL. Amazonas. Río Purus, male). 17. Forewing Rs unbranched, M four-branched (BRAZIL. Pará. Oriximiná. Río Trombetas, male). 18. Forewing Rs five-branched, crossvein Rs-pterostigma, M five-branched (BRAZIL. Amazonas. Manaus. University Campus, female). 19. Forewing Rs three-branched, M five-branched [M3 three-branched] (ECUADOR. Napo. Waorani Ethnic Reserve, female).

