

***Ecuaphlebia*: A New Genus of Atalophlebiinae (Ephemeroptera: Leptophlebiidae) from Ecuador.**

by

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The new genus *Ecuaphlebia* is established and 1 new species of the genus is described from Ecuador, based on imagines. A second species is described but not named, based on subimagines and nymphs. Diagnostic morphological characters of both nymphs and imagines are illustrated.

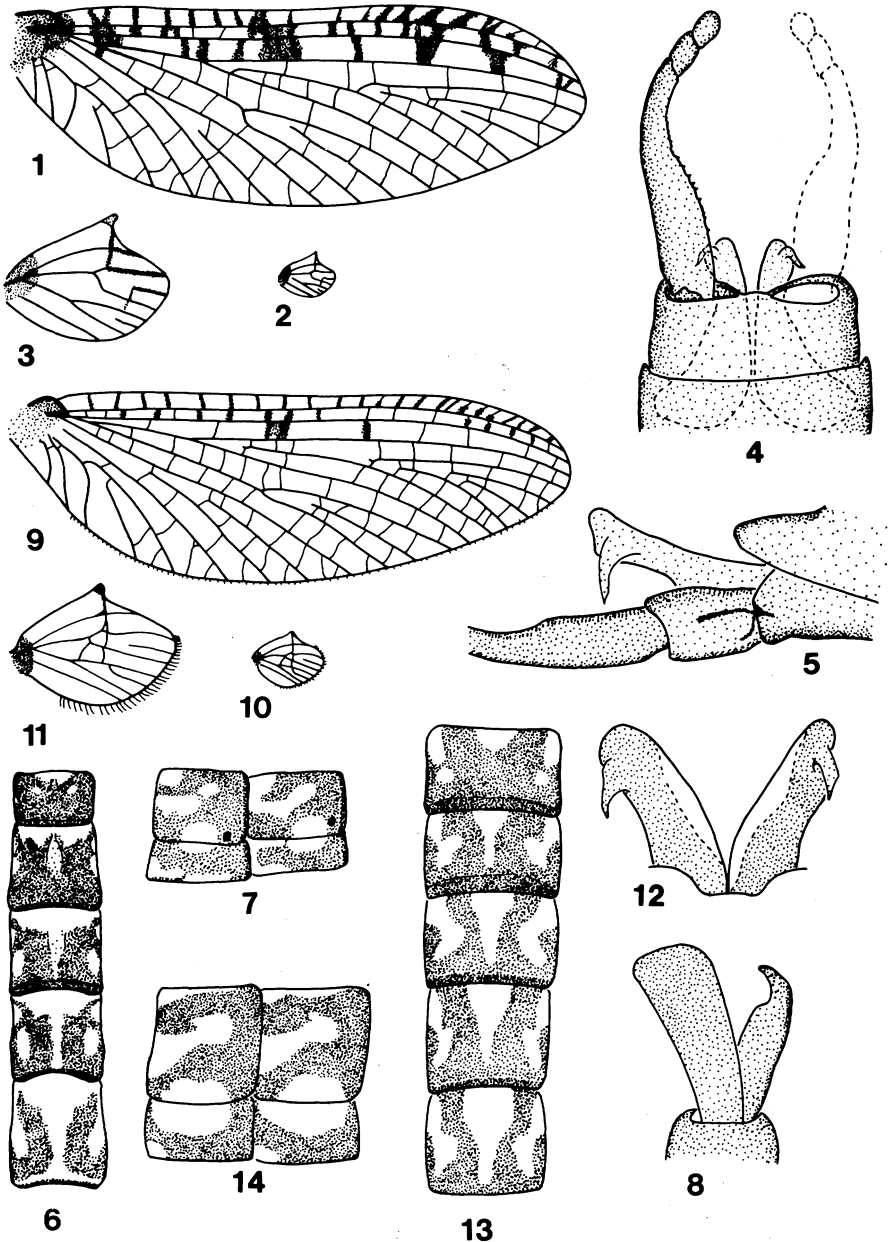
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INTRODUCTION

Many new taxa of Ephemeroptera from the Neotropical Region are in the collections of Florida A and M University and the Instituto Fundación Miguel Lillo. Among these are 2 new species from Ecuador representing an unestablished genus. There are also nymphal representatives of 2 other possible new species, but I preferred to leave these unnamed until the imagines became available. The abbreviations used for the collections are: Florida A and M University (FAMU); Instituto - Fundación Miguel Lillo (IFML) and Zoologische Staatssammlung, München, BRD (ZSM).

Genus *Ecuaphlebia*, gen. n. (Figs. 1 - 27)

Male imago. Length: body, 6.7 - 8.3 mm; fore wings, 6.4 - 10.5 mm; hind wings, 0.8 - 1.5 mm. Eyes meet on meson of head, in lateral view lower portion 0.88 length of upper portion. Wings (figs. 1-3, 9-11): maximum width of fore wings slightly less to slightly more than 1/3 maximum length of fore wings; maximum width of hind wings 7/9 maximum length of hind wings; maximum length of hind wings 1/7 - 1/8 maximum length of fore wings. Fore wings (figs. 1-9): vein Rs forked slightly more than 1/5 distance from base of vein to margin, not forming 2 triangles, fork symmetrical; vein MA forked slightly less than 1/2 distance from base of vein to margin, fork symmetrical, vein MA2 strongly sagged; vein MP2 attached at base to veins MP1 and CuA by cross veins slightly



Figs. 1 - 8. Male imago of *Ecuaphlebia rumignai* sp. n.: 1, fore wing; 2, hind wing; 3, hind wing enlarged; 4 - 5, genitalia, ventral (4), lateral (5); 6, abdominal terga 2 - 6; 7, lateral view abdominal segments 5 - 6; 8, fore claw.

Figs. 9 - 14. Male subimago *Ecuaphlebia* sp. A: 9, fore wing; 10, hind wing; 11, hind wing enlarged; 12, genitalia, ventral view (each lobe in different position); 13, abdominal terga 2 - 6; 14, lateral view abdominal segments 5 - 6.

less than $1/3$ from base of MP1 to margin; vein ICu1 attached to vein CuP, vein ICu2 attached at base to vein ICu1 by a cross vein or free basally. 120 - 140 cross veins; 8 - 9 basal to bulla, 15 - 16 distally; marginal intercalaries numerous along posterior margin of fore wings. Hind wings (figs. 2-3, 10-11) with costal projection well developed, acute, rounded at apex; base of projection narrow, apex located slightly less than $1/3$ distance from base to apex of wings; vein MP forked, furcation located $2/5$ from base of vein to margin, apex of wings rounded, slightly acute; vein Sc terminated a little more than $7/10$ from base to wing margin; 3 cross veins present. Legs: ratios of segments in prothoracic legs, 0.49: 1.00 (2.6 mm): 0.02: 0.31: 0.23: 0.14: 0.07. Claws of a pair dissimilar; one apically hooked, the other blunt, pad-like. Male genitalia: maximum length of styliger plate approximately $1/3$ of maximum width. Forceps segment $3\ 3/4$ of length of segment 2; segment 1 expanded on basal half. Penes (fig. 4-5, 12) divided from base, tubular, each lobe with a ventrolateral spine ventrally directed.

Mature nymph: Head prognathous. Antennae $2\ 1/2$ length of head. Mouthparts (figs. 15 - 23): lateral margins of clypeus (figs 15) nearly parallel. Maximum width of labrum (fig. 15) equal to slightly wider than maximum width of clypeus; length of labrum a little less than $1/2$ width of labrum, lateral margins rounded; anteromedian emargination (figs. 16 - 17) with 4 -5 denticles, the medial larger than lateral ones; 2 rows of dorsal setae near anterior margin, ventrally short setae along lateral and anterolateral margins, submedial areas with thicker setae ventrally. Outer margin of mandibles curved as in fig. 19 and with scattered hairs in basal median area, incisors and protheca of right mandible as in fig. 20. Maxillae (fig. 18): outer margin of cardo with thick setae, stipes with thin, long setae in basal half of outer margin; segments 1 and 2 of maxillary palpi subequal, segment 3 slightly less than $2/3$ length of segment 2, setae on apical half of outer margin of segment 1, and scattered on outer margin of segments 2 and 3. Lingua of hypopharynx with well developed lateral processes, anterior margin with a median cleft, submedial lobes and hairs as in fig. 21; superlingua as in fig. 21 with long setae along anterior margin. Segment 1 of labial palpi subequal to $1\ 1/10$ of segment 2, segment 3 slightly greater than $1/2$ length of segment 2, setae on segment 3 as in fig. 23, long spines on dorsal surface and small spines on inner margin of segment 1; glossae straight, with small spines along anterior margin; paraglossae as in fig. 22 with long setae on median area of ventral surface and anterolateral corners; submentum with thick setae on anterolateral corners.

Anterolateral margins of pronotum with small spines. Legs (fig. 25): posterior margin of coxae of metathoracic legs with long setae; trochanters with spines and thin setae on basal part of outer margin and with a row of spines on apico-dorsal surface; tibiae with long spines along outer and inner margins and some scattered on dorsal surface, some long setae along outer margin; tibiae and tarsi with spines along inner margins and setae along outer margins; apex of claws hooked and narrow, denticles progressively larger apically, except apical

one much larger (fig. 24). Gills (fig. 26): gills on segment 1 - 7 lanceolate, dorsal and ventral portions symmetrical and similar, progressively smaller posteriorly, trachea unbranched.

Posterolateral spines present on abdominal segments 6 or 7 - 9. Posterior margins of terga with short spines, larger and smaller alternated (fig. 27). [Caudal filaments broken at apex], delicate setae in each intersegmental joint.

Etymology: 'Ecuca': common diminutive of 'Ecuador', country where the material was collected; phlebos, Gr., meaning vein.

Type species: *Ecuaphlebia rumignau* Dominguez, new species.

Species included: *E. rumignau* sp. nov. and *E. sp. A*.

Distribution: Ecuador.

Discussion: *Ecuaphlebia* appears to be widely distributed within Ecuador and in different habitats, from slow to fast running streams. The highest collection record is from Pàramo del Angel, at 3,750 m, while the lowest altitude is 1,800 m. The size of individuals of the different species seems to be fairly variable, ranging from 5 mm to 11.5 mm.

Ecuaphlebia can be distinguished from all the other genera of Leptopebiidae by the following combination of characters: male imago, 1) vein MA2 of fore wings is strongly sagged (figs. 1, 9); 2) vein MP2 of fore wings is attached at base to veins MP1 and CuA by cross veins (figs. 1, 9); 3) vein ICu1 of fore wings is attached to vein CuP; 4) hind wings have a well developed costal projection (fig. 3); 5) vein MP2 of hind wings is forked (figs. 2 - 3, 10 - 11); 6) claws of a pair are dissimilar, one is apically hooked and the other obtuse, pad-like (fig. 8); and 7) penes are divided from the base, tubular, and each lobe has a broad ventrolateral spine ventrally directed (figs. 4-5, 12). In the nymph: 1) lateral margins of labrum are rounded and anteromedian emargination contains 4 - 5 denticles (figs. 16 - 17); 2) segment 1 of labial palpi has small spines on inner margin (fig. 23); 3) abdominal gills are symmetrical, lanceolate and have unbranched trachea (fig. 26); 4) posterolateral spines occur on abdominal segments 6 or 7 - 9; and 4) denticles on the tarsal claws are progressively larger, except apical one is much larger (fig. 24).

Ecuaphlebia appears to be more closely related to *Hagenulopsis* than to any other established genus in the subfamily, but can be differentiated easily from it by the following combination of characters: male imago, 1) hind wings are present (figs. 2 - 3, 10 - 11); and 2) each penis lobe has a broad ventrolateral spine ventrally directed (figs. 4 - 5, 12). In the nymph: 1) hind wing pads are present; 2) anteromedian emargination of labrum is wide and with 4 - 5 denticles (figs. 16 - 17).

Among the material of this genus there are nymphs from 2 other localities and these nymphs probably represent 2 distinct species. As only nymphs are available, I preferred to leave them undescribed at present. The nymphs from Cotopaxi are darker, smaller, and fairly immature compared to the nymphs of

E. sp. A, even though they were collected almost on the same week. The temperature of the water at Cotopaxi at 11 hs in the morning was 10°C. The water of the stream was clean, stony bottom, approximately 3 - 4 m wide and not canopied in the area of collection. The nymphs were under rocks. The material from Imbabura was collected at the same time of year as the Cotopaxi nymphs and in spite of being mostly immature, these nymphs are almost twice the size.

Material of *Ecuaphlebia* spp: 8 nymphs, Ecuador, Parque Nacional Cotopaxi, Quebrada Mishalaua-icu, 3.500 m, 21/III/1984, E. Dominguez (4 in IFML, 2 in FAMU, 2 in ZSM); 14 nymphs, Ecuador, Imbabura Prov., Páramo del Angel, 3.750 m, 6/III/1980 S. Halloy coll. (6 in IFML, 6 in FAMU, 2 in ZSM).

***Ecuaphlebia rumignai* sp. n. (Figs. 1 - 8)**

Holotype male imago (in alcohol, one pair of wings, fore legs and genitalia on slides). Length: body, 6.7 - 6.9 mm; fore wings, 6.4 - 6.5 mm; hind wings, 0.8 - 0.9 mm. General coloration: brownish on thorax, grayish black on abdomen.

Head: brownish yellow, washed with black, especially along margins. Upper portion of eyes brownish yellow, lower portion black. Basal 1/3 of ocelli black, apical 2/3 white. Lateral ocelli twice diameter of median one. Antennae: scape yellowish washed with black, basal 1/2 of pedicel yellowish, apical 1/2 blackish, flagellum whitish.

Thorax: pronotum yellowish with lateral and posterior margins and medial and paramedial areas darker; meso- and metanotum brownish yellow, except posteromedial portion of mesonotum, median area of metanotum, carinae and margins of sclerites washed with black; pleura brown, washed heavily with black; sterna grayish black, except median area brownish. Wings (figs. 1 - 3): membrane of fore wings hyaline, stigmatic area translucent, wing base brown. Longitudinal and cross veins brown, paler toward anal area; cross veins between veins C - Sc, Sc - R1 and R1 - R2 clouded with brown. Membrane of hind wings hyaline, costal projection cloudy white and basally washed with brown; veins C and CuA grayish, other veins brownish, a weak remainder of base of MA present, 1 intercalary present in fork of vein MP. Fore legs: coxae yellowish brown, trochanters yellowish, femora blackish yellow with a subapical yellowish white band, remainder of legs yellowish white, except a median transverse band and apex of tibiae brownish. [All other legs broken off and lost].

Abdomen (figs. 6 - 7) segments 1 - 6 semihyaline, segments 7 - 10 opaque; tergum 1 almost completely washed with black, except for a small hyaline spot close to anterolateral corners, terga 2 - 4 washed with black except for hyaline anteromedian area and 2 lateral spots, area wider posteriorly, on tergum 5 anteromedian area extends to posterior margin, terga 6 - 7 with paired U-shaped black stripes divergent on median line, terga 8 - 10 with a translucent T-shaped area in medial and anterior areas plus 1 hyaline spot at each side, remainder black; sterna washed with black except lateral, anterolateral and anteromedial areas.

Genitalia (figs. 4 - 5): styliiger plate, penes and basal 1/2 of forceps brownish yellow, remainder of forceps whitish yellow, appendages of penes as in fig. 5. Caudal filaments: basal 2 segments entirely whitish, basal 1/3 and apical 1/5 of each segment blackish, remainder of each segment whitish, paler towards apex.

Female imago and nymph: Unknown.

Holotype, male imago, ECUADOR, 40 km SE of Santo Domingo de los Colorados, 2/V/1978. L. & C. W. O'Brien (FAMU).

Etymology: rumignai, named after Rumifñai, General of the Inca Atahualpa, who fought against the Spanish conquerors in the area of Quito.

Discussion: This species is known only from the holotype. The male imago of *Ecuaphlebia rumignai* can be separated from the male subimago of *Ecuaphlebia sp. A.* by the following combination of characters: 1) length of body is 6.7 - 6.9 mm; 2) cross veins of fore wings between veins C - Sc, Sc - R1 and R1 - R2 are clouded with brown (fig. 1); 3) base of vein MP2 of fore wings is attached to base of vein MP1 by an extremely small cross vein (fig. 1); and 4) black marks on abdomen are more extensive, as in figs. 6 - 7.

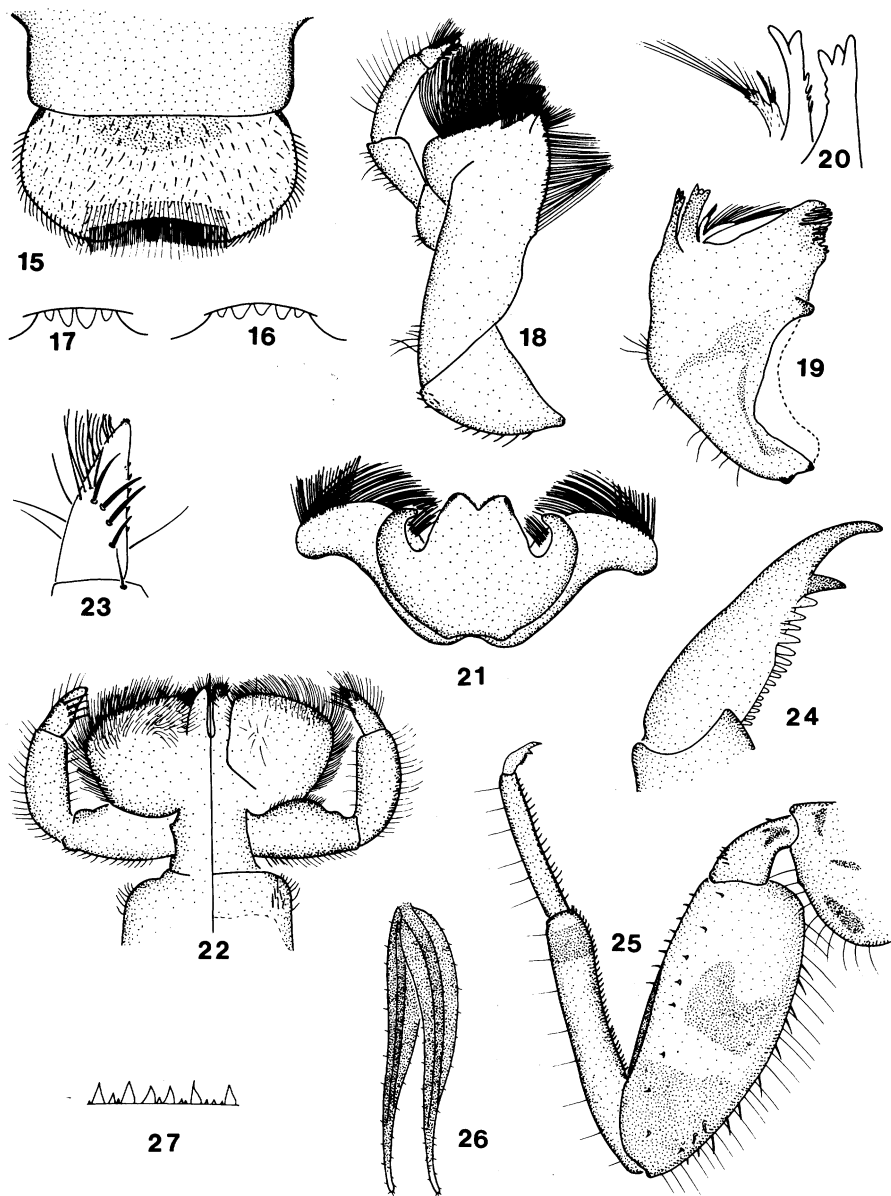
Biology: Unknown.

***Ecuaphlebia sp. A.* (Figs. 9 - 27)**

Male subimago (in alcohol, one pair of fore and hind wings and one set of pro-meso- and metathoracic legs on slides): Length: body, 8.2 - 8.3 mm; fore wings, 10.3 - 10.5 mm; hind wings, 1.3 - 1.5 mm. General coloration: brownish gray.

Head: yellowish, especially along margins and around base of antennae. Upper portion of eyes yellowish gray, lower portion black. Basal 1/2 of ocelli black, apical 1/2 white. Lateral ocelli twice diameter of median one. Antennae: scape and pedicel blackish, flagellum grayish.

Thorax: pronotum light brown, with blackish margins and a median black M-shaped mark; mesonotum brown, with medial area white and posteromedial portion grayish; metanotum light brown, washed with black along posterior margin; pleura whitish, washed heavily with black; sterna whitish washed heavily with black, except medial area light brown. Wings (figs. 9 - 11): membrane of fore and hind wings translucent; wing base of fore and hind wings grayish; longitudinal and cross veins of fore and hind wings blackish, paler towards anal margin, cross veins of fore wings between veins C - Sc, Sc - R1 and R1 - R2 lightly clouded with gray. Legs: (fig. 25) coxae and trochanters yellowish, heavily washed with black; fore femora yellow washed with black except for a subapical paler transverse band, mid and hind femora yellow with an apical transverse band black, tibiae yellow with extreme base and apex blackish, remainder of legs light yellow, slightly washed with gray; claws orange.



Figs. 15 -27. Nymph of *Ecuaphlebia* sp. A.: 15, labrum dorsal; 16, detail of anteromedian emargination; 17, variation of denticles on anteromedian emargination; 18, left maxilla; 19, left mandible; 20, detail incisors and prosthema of right mandible; 21, hypopharynx; 22, labium, (left dorsal, right ventral); 23, detail segment I labial palpi, dorsal; 24, tarsal claw; 25, leg 1, dorsal; 26, gill 2; 27, posterior margin of tergum 5.

Abdomen (figs. 13 - 14): segments whitish translucent, terga 1 and 8 - 10 almost completely washed with black, terga 2 - 7 washed with black, except for pale anteromedial V - shaped area, a pale lateral semicircular area, pale anterolateral triangular, and a pale circular submedial area that fuses on segments 3 - 7; sterna completely washed with black, except sterna 2 - 10 with a whitish anterolateral and lateral whitish semicircular areas.

Genitalia (fig. 12): medial 1/3 of styliger plate whitish, lateral portions blackish, forceps grayish brown, lighter towards apex; penes whitish, with appendages as in fig. 12. Caudal filaments: basal 1/3 of each segment grayish, remaining segments white, all covered with blackish setae.

Female: Unknown.

Mature nymph (in alcohol). Body length, 8.0 - 12.0 mm. General coloration: light brown with grayish markings. Head: light brown washed with grayish, except area between lateral ocelli and eyes, and a triangular spot in front of median ocellus paler. Ocelli white, with inner margins black. Eyes: upper portion of males orange brown, lower portion black, eyes of females black. Antennae: scape and pedicel blackish, flagellum pale yellow. Mouthparts (figs. 15 - 23): light brown, basal 1/3 of labrum, basal 1/2 of mandibles, cardo and outer margin of stipes of maxillae, and medial area of submentum of labium shaded with black. Thorax: light brown with lateral and anterior margins and a M-shaped spot on meson of pronotum, and carinae on meso- and metanota blackish; pleura blackish, sterna yellowish washed lightly with black. Legs: yellowish except coxae washed with black, and basal 1/2, distal 1/4 of fore femora, distal 1/3 of mid and hind femora blackish, a transverse band at apex of tibiae and tarsi blackish. Claws (fig. 24) with 12 - 15 denticles progressively larger apically, except apical one much larger. Abdomen: terga and sterna yellowish with same color pattern as in the male subimago. Posterior margin of terga (fig. 27) with short spines, larger and smaller alternated. Gills (fig. 26): grayish black, trachea darker. Caudal filaments yellowish.

Male subimago, 1 nymph, Ecuador, Chimborazo Province, Alpachaca, 25/III/1984, E. Dominguez (IFML); 10 nymphs Ecuador, Pichincha, camino entre Chillogallo y Alluriquin, 2,600 m, 29/III/1984, E. Dominguez 5 in IFML, 3 in FAMU, 2 in SZM. The association of the adult and nymph was made by the abdominal color pattern on specimens from the same locality.

Variations: In one of the nymphs, the labrum has 4 denticles on the anteromedian emargination (fig. 17) instead of 5 denticles. In some of the nymphs the coloration is faded.

Discussion: The male subimago of *E. sp. A* can be distinguished from the male imago of *E. rumignai* by the following combination of characters: 1) the length of the body is 8.2 - 8.3 mm; 2) cross veins in the fore wings between veins C - Sc, Sc - R1 and R1 - R2 are lightly clouded with gray (fig. 9); 3) base of vein MP2 of fore wings is attached to base of vein MP1 by a short cross veing (9); and 4) black marks on abdomen are less extensive, as in figs. 13 - 14.

Biology: The nymphs of *E. sp. A* were collected between 1,800 and 2,600 m in

rocky streams canopied by forest. The subimago was collected flying at 10 hs in the morning.

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