

RESEARCH ARTICLE

A new species of *Americabaetis* (Ephemeroptera: Baetidae) from Itatiaia National Park, Brazil

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<https://zoobank.org/9BC22CAB-FB71-4E9B-A77C-9113CD4A2A54>

ABSTRACT. A new species of *Americabaetis* Kluge, 1992 is described based on nymphs and subimagos from Itatiaia National Park, close to the border of Minas Gerais and Rio de Janeiro, Brazil. The new species can be differentiated from the remaining species of the genus based on the following combination of characteristics: (1) frontal keel present, (2) right mandible with angle between incisors and mola obtuse, (3) paraglossa nearly twice longer than wide, (4) fore femur with 40–42 long, apically acute, simple setae in outer margin, (5) gills grayish with pigmented tracheation, (6) distinctive abdominal color pattern (two white posterolateral spots on abdominal terga IV and VII, white medial band running along abdominal terga, and lateral margins washed with brown), (7) posterior margin of abdominal terga with triangular spines, and (8) paraproct marginally with 12–14 spines. Given the development of the labial palp segment III, shape of the apex of the lingua, and robustness of the body, the new species is somewhat similar to *A. labiosus* and *A. titthion*. It can be readily distinguished from *A. titthion* by the absence of meso and metasternal projections and by the shape of spines on the posterior margin of abdominal terga (triangular on the new species, blunt on *A. titthion*). The main differences between the new species and *A. labiosus* are the paraglossa length/width ratio (2.3x in the new species, 2.5x in *A. labiosus*), the relative length of the maxillary palp (longer than galea-lacinia in the new species versus subequal in *A. labiosus*), as well as pigmentation of tracheae on gills (which is absent in *A. labiosus*). The abdominal color pattern of *A. itatiaia* sp. nov. is also very distinctive in relation to *A. labiosus* and *A. titthion*.

KEY WORDS. Baetinae, Insecta, Neotropic, taxonomy.

INTRODUCTION

Americabaetis was originally proposed by Kluge (1992) as a subgenus of *Baetis* Leach, 1815 and included a single species from Cuba. Lugo-Ortiz and McCafferty (1996), two years after proposing the synonym of *Americabaetis* with *Acerpenna* Waltz & McCafferty, 1987 (Lugo-Ortiz and McCafferty 1994), reinstated its generic rank, transferred three species from *Acerpenna* to *Americabaetis*, and described five new species from South America. Hofmann et al. (1999) described two new species from Guadeloupe and in the same year Waltz and McCafferty (1999) described a single species from Costa Rica. Currently, the genus is part of Baetinae

(Cruz et al. 2021) and is represented by 19 species, 18 from the Neotropics, and one from the southern limits of the Nearctic region (Wiersema and McCafferty 1999).

Americabaetis can be differentiated from the remaining genera of Baetidae by the following combination of characteristics in the nymphs: (1) mandibles with a tuft of setae between the prostheca and mola, (2) labium with rectangular paraglossa, glossa shorter than paraglossa and labial palp segment II with a variable distomedial process, (3) hindwing pads (and hindwings) absent, (4) apically rounded gills on abdominal segments II–VII only, and (5) abdominal terga with scales in operculate sockets (Lugo-Ortiz and McCafferty 1996).

Lugo-Ortiz and McCafferty (1996) were the first authors to report the presence of *Americabaetis* in Brazil. Of the five species described by them from South America, four were described and/or reported from Brazil. Lugo-Ortiz et al. (2002) and Francischetti et al. (2003) presented the first record of the genus from states of Espírito Santo and Rio de Janeiro, respectively, while Salles et al. (2004) described the female imago stage of *A. titthion* Lugo-Ortiz & McCafferty, 1996. Later, Salles and Boldrini (2008) described the male imago of *A. longetron* Lugo-Ortiz & McCafferty, 1996 and proposed the first key for the adults of the genus. Two years after, Salles et al. (2010) revised the genus in Brazil, described a species from the southern part of the country, the male adult of *A. labiosus* Lugo-Ortiz & McCafferty, 1996; and provided a key for South American nymphs.

In the present contribution, based on nymphs and subimagos from Itatiaia National Park, on the borders of Minas Gerais and Rio de Janeiro, Brazil, we describe a new species of *Americabaetis*.

MATERIAL AND METHODS

The specimens were collected in Itatiaia National Park, close to the border of Minas Gerais and Rio de Janeiro (Fig. 1). The nymphs were collected using manual aquatic nets and some mature nymphs were reared to obtain the subimagos. The collected material was preserved in 80% ethanol. The images of habitus of the specimens were obtained using a stereomicroscope LEICA M205 A with a coupled camera LEICA MC170 HD. Mouth parts, legs, gills, and paraproct were studied and photographed in a OLYMPUS CX31 microscope coupled with a Moticam A5 camera. Morphological characteristics were illustrated on Adobe Illustrator® 2022 based on a series of images following the methodology proposed by Coleman (2003, 2006, 2009). All images and illustrations were finally processed in Adobe Photoshop® 2022.

The distributional map was made on the software QGIS 3.26.2. The collectors of the specimens were Frederico Falcão Salles (FFS), Mellis Layra Soares Rippel (MLSR),

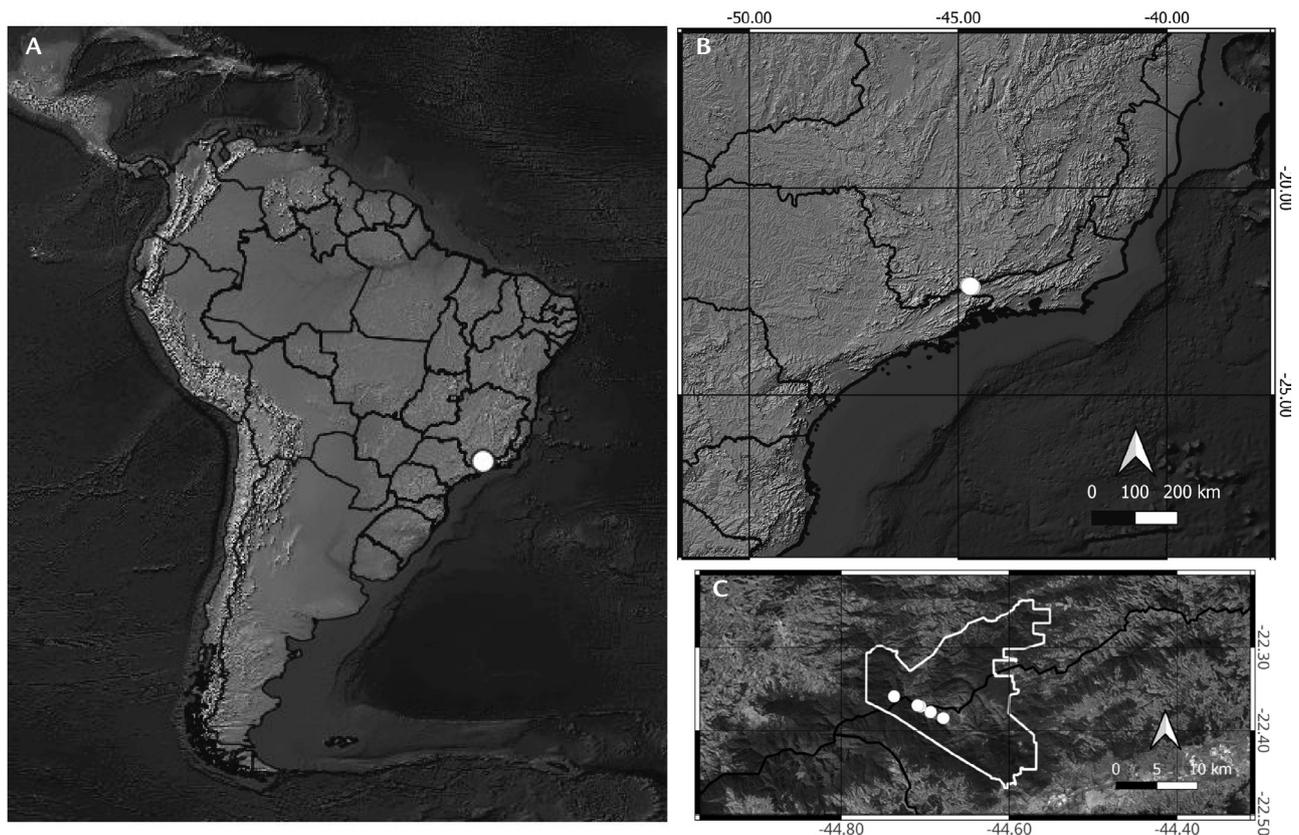


Figure 1. Distributional map showing the occurrence of *Americabaetis itatiaia* sp. nov.: (A) map of South America with detail in Brazil; (B) Minas Gerais and Rio de Janeiro border; (C) Itatiaia National Natural Park, Rio de Janeiro.

Isabel Cristina Hernández Cortes (ICHC), and Pedro Bonfá Neto (PBN). The material examined is housed in the Museu de Entomologia da Universidade Federal de Viçosa (UFVB), Viçosa, Minas Gerais, Brazil and Museu Nacional do Rio de Janeiro (MNRJ), Rio de Janeiro, Brazil.

TAXONOMY

Americabaetis itatiaia Marulanda-Lopez & Salles,
sp. nov.

<https://zoobank.org/6E5C0DF7-5D10-4077-84F9-7031A2F5E2FE>

Diagnosis. Nymphs: (1) frontal keel present, (2) right mandible with angle between incisors and mola obtuse, (3) paraglossa nearly 2x longer than wide, (4) fore femur with 40–42 long, apically acute, simple setae in outer margin, (5) gills grayish with pigmented tracheation, (6) distinctive abdominal color pattern, (7) posterior margin of abdominal terga with triangular spines, and (8) paraprocts marginally with 12–14 spines. Male subimago: (1) turbinate eyes uniformly separated from each other, upper surface ellipsoidal and orangish, (2) abdominal terga brown, except for yellowish brown sigilla and medial stripe, and terga X.

Description

Nymph. Measurements: Body length 5.74 mm; cerci length 2.93 mm, medial terminal filament length 2.0 mm (Terminal filament 0.7x length of cerci).

Head: Coloration brown, except for cream area between inner margin of compound eye and lateral ocelli, and between median ocellus and frontal keel. Antenna with scape and pedicel brown, flagellum light brown and darker toward apex. Epicranial suture with lateral branch sinuous. Frontal keel present. Antenna with scape and pedicel sub-cilindric (Fig. 4A, B).

Labrum (Fig. 2A). Nearly quadrangular; length about 0.8x maximum width. Distal margin with medial emargination and small process, with setae basally bifid and pectinate (not illustrated); dorsally with short, fine, simple setae scattered over surface. Distolateral corner rounded. Dorsolateral arc of setae composed of (3–4) + 1 + 1 long, spine-like setae. Lateral margin with bifid setae (not illustrated). Ventral surface with four short, spine-like setae near distolateral corner.

Left mandible (Fig. 2B). Incisors fused; inner and outer set of incisors with 3 + 3 denticles; prosthema robust, apically denticulate and with comb-shape structure at apex. Angle between incisors and mola obtuse. Margin between prosthema and mola with tuft of setae and with small crenulation close to subtriangular process. Subtriangular process wide, above level of area between prosthema and mola. Apex of mola with strong pectinate setae.

Right mandible (Fig. 2C). Incisors fused; inner and outer set of incisors respectively with 4 + 3 denticles; prosthema robust, apically denticulate. Angle between incisors and mola obtuse. Margin between prosthema and mola with row of setae. Tuft of spine-like setae at base of mola present. Apex of mola with a single pectinate setae.

Hypopharynx (Fig. 2D). Lingua longer than superlingua; apex of lingua acute. Superlingua not expanded, distally truncate; short, fine, simple setae scattered over lateral and distal margin.

Maxilla (Fig. 2E). Medial protuberance of galea with 5 + 1 simple setae. Maxillary palp 1.4x length of galea-lacinia, with short, fine simple setae scattered over its surface. Palp segment II subequal to palp segment I.

Labium (Fig. 2F). Glossa broad basally, narrowing distally and shorter than paraglossa (0.8x length of paraglossa); inner margin with 7–8 spine-like setae, outer margin with 7 long spine-like setae increasing in length apically. Paraglossa sub-rectangular with length/width ratio 2.3x; apex with three rows of apically pectinate setae. Labial palp segment I 0.8x the length of segments II and III combined; segment I covered with short, simple setae on outer and inner margins and micropores along outer margin; segment II with moderate and rounded distomedial protuberance (width of distomedial protuberance 0.8x the base of segment III); inner margin with short simple setae, more numerous at apex; outer margin with few, short, simple setae and dorsally with row of 4–6 fine and simple setae; segment III distally rounded, length 1.2x width; covered with spine-like and fine, simple setae.

Thorax (Fig. 4C, D): General coloration brown with light brown marks.

Foreleg (Fig. 3A). Coloration brown. Ratio of foreleg 1.2:1.0:0.6:0.2. Forefemur. Length about 3x maximum width; outer margin with row of 40–42 apically acute, simple setae (length of setae about 0.1x maximum width of femur). Dorsal surface with row of short spine-like setae close to inner margin and micropores close to outer margin. Inner margin with strong spine-like setae in basal half. Tibia. Outer margin with a row of scarce, short, fine simple setae; inner margin with one row of spine-like setae. Tibio-patellar suture present. Tarsus. Outer margin with scarce short simple setae; inner margin with one row of spine-like setae. Tarsal claw with one row of 12–13 denticles, Mid and hind legs similar to foreleg.

Abdomen (Fig. 4C, D): General coloration brown. Terga IV, VII, and X with lateromedial white marks; terga II to VII with sublateral white longitudinal marks; terga II to X with anterior sigilla black; terga II to IX with white longitudinal discontinuous mid stripe (Fig. 4C, D). Sterna.

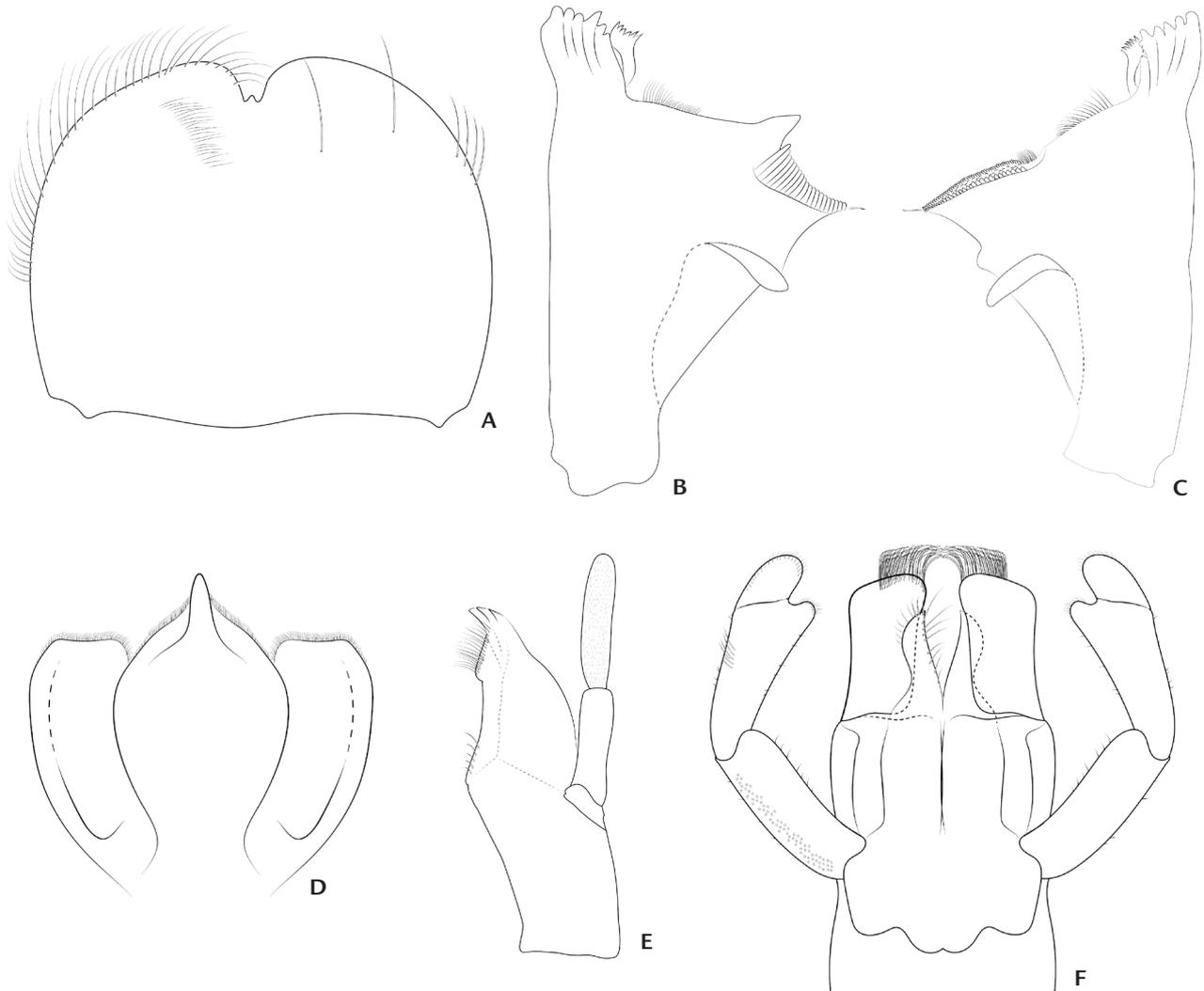


Figure 2. *Americabaetis itatiaia* sp. nov., mouth parts of the holotype: (A) labrum, left ventral view, right dorsal view; (B) left mandible, ventral view; (C) right mandible, dorsal view; (D) hypopharynx, dorsal view; (E) maxilla, dorsal view; (F) labium, left dorsal view, right ventral view.

General coloration light brown; anterior sigilla dark running along the abdominal segment I–VII; lateral margins of abdominal terga washed with brown. Terga (Fig. 3B). Surface with abundant scales and scale-bases; posterior margin with triangular spines. Gills (Fig. 3C). Costal and anal margins with narrow spines intercalating short, fine, simple setae; pigmented tracheation extending from main trunk to both margins. Paraproct (Fig. 3D), with 12–14 marginal spines; surface with scale or scale-bases; posterolateral extension with 12 minute marginal spines. Caudal filaments. Coloration brown. Posterior margin of segments with short spines on

each segment. Inner margin of cercus and inner and outer margin of terminal filament with tufts of long, simple setae.

Male subimago (in alcohol). Measurements: Lengths: body, 5.14 mm; fore wing: 5.44 mm.

General coloration brown.

Head (Fig. 5A, B): Light yellowish brown; ocelli surrounded with dark brown. Antennae whitish, scape and flagellum slightly washed with brown. Turbinate eyes uniformly separated from each other, upper surface ellipsoidal, orangish; basal half of stalk light yellowish brown, paler toward apex, apical half light yellowish brown.

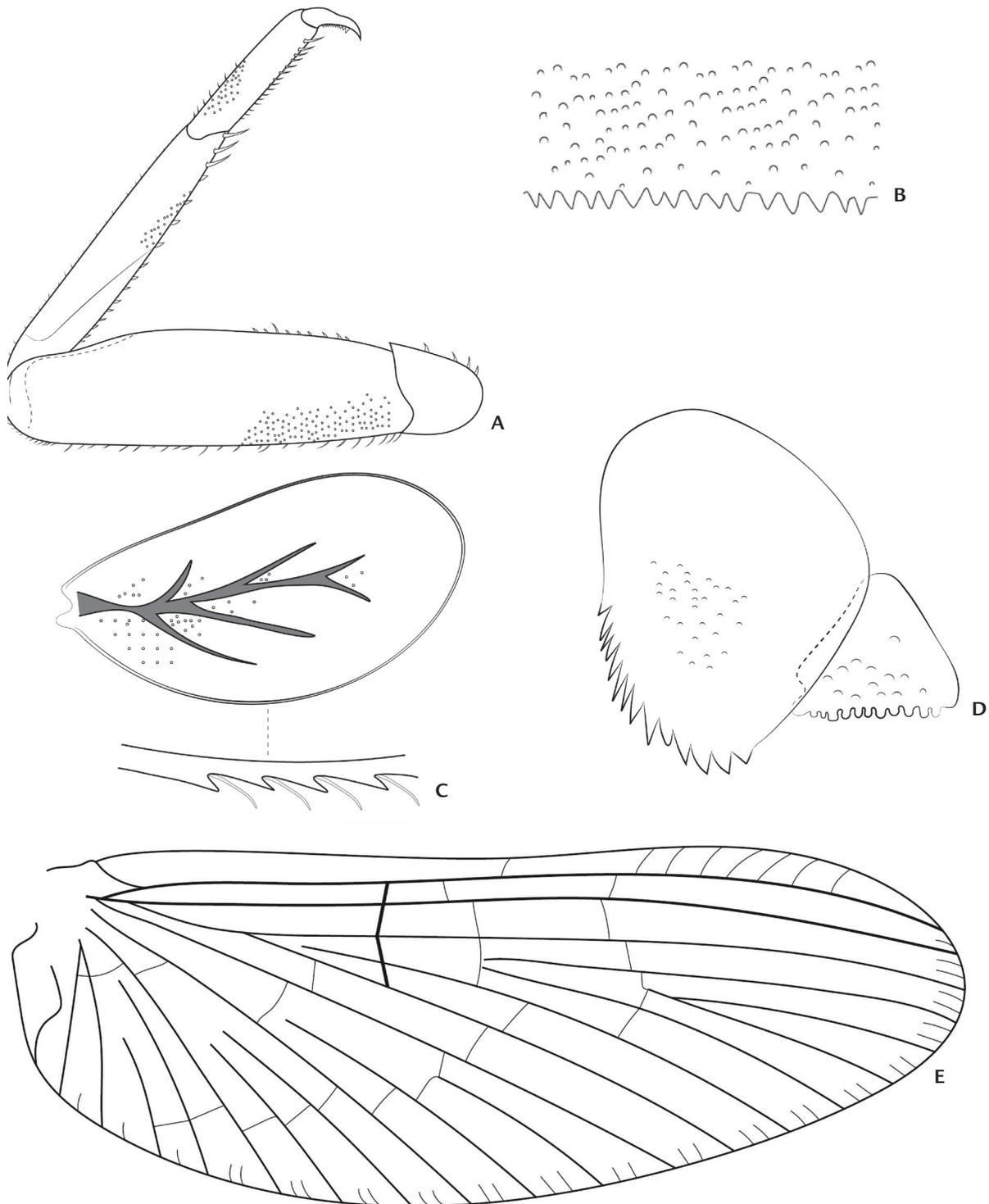


Figure 3. *Americabaetis itatiaia* sp. nov., other structures of the holotype (A-D) and winged stages (E): (A) fore leg; (B) posterior margin of abdominal terga IV; (C) gill IV with margin detail; (D) paraprot; (E) fore wing, black line highlighting the bullae trajectory.

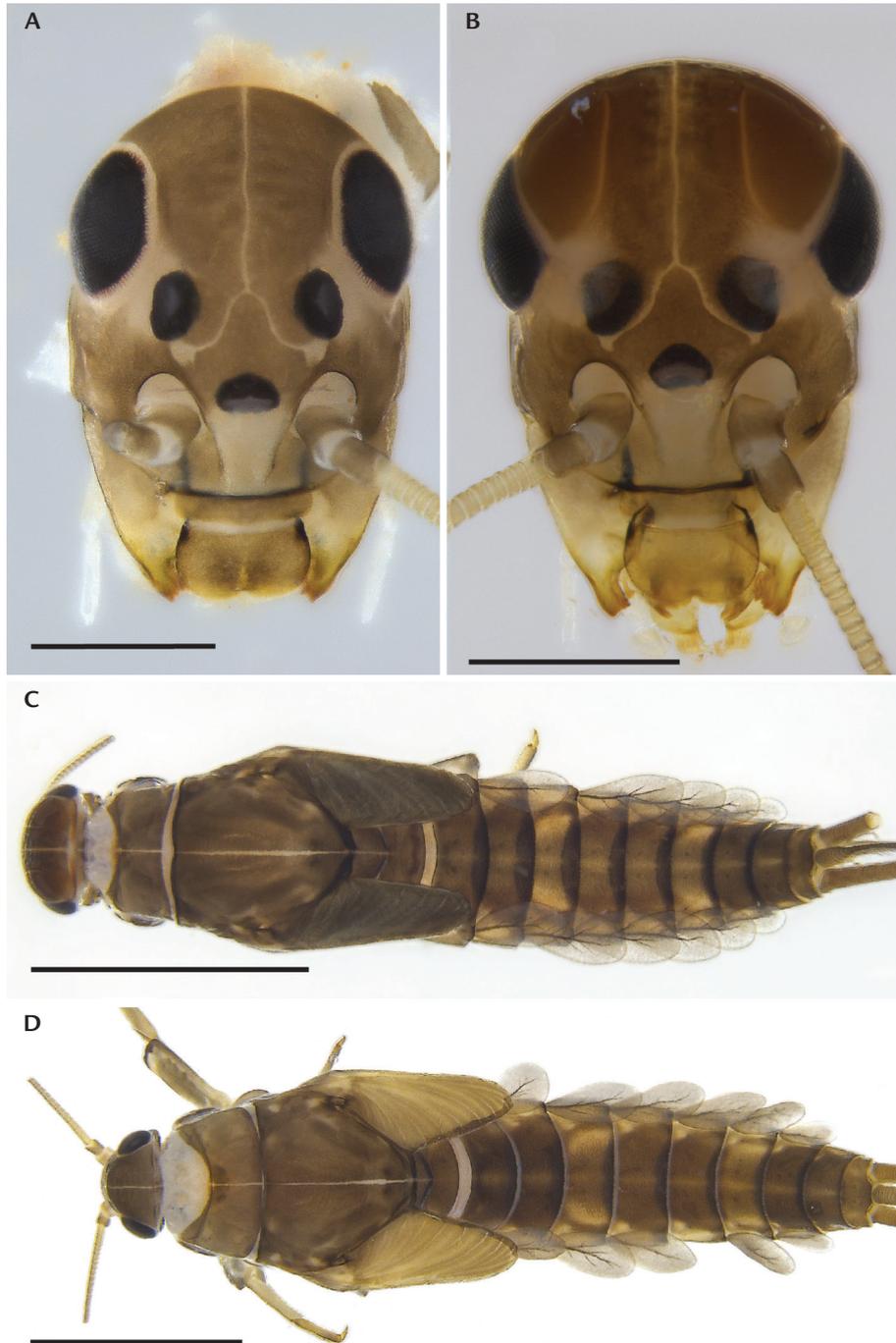


Figure 4. *Americabaetis itatiaia* sp. nov., nymphs: (A) head of female; (B) head of male; (C) habitus of male in dorsal view; (D) habitus of female in dorsal view. Scale bars: A, B = 500 μ m, C, D = 2 mm.

Thorax (Fig. 5C): Pro and metanota brown; mesonotum brown with light yellowish brown mark on antero-notal transverse impression, light yellowish brown along

lateroparapsidal suture, posterior scutal protuberance dark brown. Legs. Hind tibia 0.5x the length of femur, tarsi 0.3x in length to femur and with four segments decreasing in length



Figure 5. *Americabaetis itatiaia* sp. nov., subimagos, male (A-D), female (E): (A) head, dorsal view; (B) head and thorax, lateral view; (C) habitus, dorsal view; (D) habitus, lateral view; (E) abdomen, dorsal view. Scale bars: A, B = 500 μ m, C–E = 1 mm.



Figure 6. General aspect of new species habitat: (A) Campo Belo spring, type locality; (B) Pedra do Camelo stream.

apically. Wing (Fig. 3E): membrane grayish, except for costal and subcostal area grayish brown, costal brace tinged with yellowish brown; longitudinal veins light brown, transversal and intercalary veins whitish. Three bullae in the subcostal veins, RP1 and RP3+4. Angle forming the trajectory of the bullae directed toward the basal region of the wing.

Abdomen (Fig. 5C, D): Terga brown, except for yellowish brown sigilla and medial stripe; posterior margin of segments II to VIII dark brown. Sterna light brown, posterolateral margins dark brown; segments II to VIII yellowish brown sigilla. Forceps light brown, distal segment whitish; cerci whitish.

Female subimago (in alcohol). Measurements: Lengths: body, 6.52 mm; fore wings: folded.

General coloration brown.

Head: Light yellowish brown; ocelli surrounded with dark brown. Antennae whitish, scape and flagellum slightly washed with brown.

Thorax: Pro and metanota brown; mesonotum brown with light yellowish-brown mark on anteronotal transverse

impression, light yellowish brown along lateroparapsidal suture, and with posterior scutal protuberance dark brown. Legs light yellowish brown.

Abdomen (Fig. 5E): as in male. Cerci broken.

Imagos: unknown.

Material examined. Type material. HOLOTYPE: BRAZIL, 1 male mature nymph; mouthparts, legs and paraprotecs in slides; Itatiaia National Park, border of Minas Gerais and Rio de Janeiro; Waterhead of Campo Belo River; S 22°21'40"/W 44°41'37"; 2400 m.a.s.l.; 17/iii/2022; FFS, MLSR, ICHC, PB cols. (UFVB). PARATYPES: BRAZIL, 12 nymphs (5 males and 7 females), same data as holotype (UFVB). 14 nymphs (4 males and 10 females); Itatiaia National Park, border of Minas Gerais and Rio de Janeiro; Rebouças dam; S 22°23'06"/W 44°40'43"; 2380 m.a.s.l.; 17/iii/2022; FFS, MLSR, ICHC, PB cols. (UFVB). 14 nymphs (3 males and 11 females); Itatiaia National Park, border of Minas Gerais and Rio de Janeiro; Pedra do Camelo stream; S 22°22'11"/W 44°42'33"; 2350 m.a.s.l.; 17/iii/2022; FFS, MLSR, ICHC, PB cols. (UFVB). 19 nymphs (6 males and 13 females); Itatiaia National Park,

border of Minas Gerais and Rio de Janeiro; stream close to the road Km 12; S 22°22'15"/W 44°42'21"; 2380 m.a.s.l.; 17/iii/2022; FFS, MLSR, ICHC, PB cols. (UFVB).

Forty-four nymphs (9 males and 35 females) and 2 subimagos, wings in slides (1 male with nymphal exuviae and female); Itatiaia National Park, border of Minas Gerais and Rio de Janeiro; Brejo da Lapa; S 22°21'32"/W 44°44'14"; 2140 m.a.s.l.; 16/iii/2022; FFS, MLSR, ICHC, PB cols. (UFVB). 44 nymphs (9 males and 35 females) and 1 subimago (female); Itatiaia National Park, border of Minas Gerais and Rio de Janeiro; Brejo da Lapa; S 22°21'32"/W 44°44'14"; 2140 m.a.s.l.; 16/iii/2022; FFS, MLSR, ICHC, PB cols. (MNRJ).

Etymology. The name of the new species is an allusion to the word itá-ti-aia, name of the National Park and which in *Tupi Guarani* means wet stone.

Distribution and habitat. Brazil: Itatiaia National Park (Fig. 1). The new species was collected in headwaters of the Campo Belo stream, from Itatiaia National Park, close to the border of Minas Gerais and Rio de Janeiro, in an altitudinal range of 2140–2400 m a.s.l. (Fig. 6) along the Mantiqueira mountain range. The new species was collected exclusively in the Itatiaia Plateau region, also known as “Upper Part”, with high fields and hanging valleys with several river sources (ICMBio 2022).

Remarks. Given the development of the labial palp segment III and robustness of the body, the new species is somewhat similar to *A. labiosus* and *A. titthion*. It can be distinguished from *A. titthion* by the absence of meso and metasternal projections and by the shape of spines on the posterior margin of abdominal terga (triangular on the new species, blunt on *A. titthion*). The main differences between the new species and *A. labiosus* are the paraglossa length/width ratio (2.3x in the new species, 2.5x in *A. labiosus*), the relative length of the maxillary palp (longer than galea-lacinia in the new species versus subequal in *A. labiosus*), as well as pigmentation of tracheae on gills (which is absent in *A. labiosus*). The abdominal color pattern of *A. itatiaia* sp. nov., characterized by two white posterolateral spots on abdominal terga IV and VII (as in *A. alphus*), a white medial band running along the abdominal terga (as in *A. longetron*), and lateral margins washed with brown, is also very distinctive in relation to these two species. The imago is unknown, but the subimagos can be differentiated by the turbinate eyes uniformly separated from each other, upper surface ellipsoidal and orangish; mesonotum brown, with light yellowish brown mark on anteronotal transverse impression, light yellowish brown band along lateroparapsidal suture; and abdominal terga brown, except for yellowish brown sigilla and medial stripe.

ACKNOWLEDGEMENTS

We thank Isabel Cristina Hernandez, Mellis Layra Soares, and Pedro Bonfá for assistance in the field. We also thank Og De Souza (Termitology Laboratory of the Universidade Federal de Viçosa) for facilitating the use of optic equipment and Pedro Bonfá for assistance during the map elaboration. Finally, we thank ICMBio and Parque Nacional de Itatiaia for facilitating the sampling of macroinvertebrates in the park. This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior to JFML (Capes process 88887.510807/2020-00) and by the Conselho Nacional de Desenvolvimento Científico e Tecnológico to FFS (CNPq process 309666/2019-8).

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- Submitted: November 16, 2022
Accepted: August 3, 2023
Editorial responsibility: Ralph Holzenthal
-
- Author Contributions**
FFS conceived the research, conducted the field work and produced the final plates. JFML wrote the document and elaborated the maps and illustrations. All authors critically review the manuscript and approved the final version of this paper.
- Competing Interests**
The authors have declared that no competing interests exist.
- How to cite this article**
Marulanda-Lopez JF, Salles FF (2023) A new species of *Americabaetis* (Ephemeroptera: Baetidae), from Itatiaia National Park, Brazil. *Zoologia* 40: e22054 <https://doi.org/10.1590/S1984-4689.v40.e23054>
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