

Taxonomic notes of the Neotropical alderfly genus *Ilyobius* Enderlein, 1910 (Megaloptera, Sialidae), with description of a new species

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Abstract

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The alderfly genus *Ilyobius* Enderlein, 1910 is one of the rare groups of Sialidae and mainly distributed in the Neotropical region. Here we describe a new species, *I. curvata* sp. n., from Panama and Colombia. Furthermore, we provide re-description on two described species of *Ilyobius*, i.e., *I. flavicollis* (Enderlein, 1910) and *I. nubila* (Navás, 1933). A key to the species of *Ilyobius* is given. The geographical distribution pattern of extant *Ilyobius* species is also summarized.

Key Words

Ilyobius

Sialidae

taxonomy

new species

Neotropics

Introduction

The alderfly genus *Ilyobius* Enderlein, 1910 is one of the distinct but rare groups of Sialidae. This genus was previously treated to be a junior synonym of *Protosialis* van der Weele, 1909 (Penny 1981), but was recently recovered to be valid based on a comprehensive phylogenetic study on the world Sialidae (Liu et al. 2015). The adults of *Ilyobius* are characterized by the distinct coloration (generally orange, sometimes with dark markings) of head and pronotum, the wing venation (Rs with two simple branches, MP with one simple anterior and one bifurcate posterior branch), the presence of male endophallus with blackish thorny setae, the female sternite 7 being distinctly prominent at the posterior middle, and the female gonocoxites plus gonapophyses 8 together presenting as a sclerotized complex. Currently, *Ilyobius* comprises all extant Neotropical alderflies except *Protosialis bifasciata*

(Hagen, 1861), which is still placed in *Protosialis* (Liu et al. 2015). Moreover, because of the similar wing venations, three fossil species are also placed in *Ilyobius*, i.e., †*Ilyobius casca* (Engel & Grimaldi, 2007) from the Miocene Dominican amber, †*Ilyobius baltica* (Wichard, 1997) from the Eocene Baltic amber, and †*Ilyobius herlingi* (Wichard, 2002) also from the Eocene Baltic amber, the latter two of which have tentative generic placement (Liu et al. 2015).

Compared with the other alderfly genera, the genus *Ilyobius* is still poorly known due to its rareness (Contreras-Ramos 2008). Among the eight described species of *Ilyobius*, five of them, i.e., *I. chilensis* (McLachlan, 1871), *I. flammata* (Penny, 1981), *I. hauseri* (Contreras-Ramos, Fiorentin & Urakami, 2005), *I. mexicana* (Banks, 1901), and *I. ranchograndis* (Contreras-Ramos, 2006), have modern descriptions or re-descriptions (Contreras-Ramos 2006, 2008; Contreras-Ramos et al. 2005), but the

remaining three, i.e., *I. bimaculata* (Banks, 1920), *I. flavicollis* (Enderlein, 1910), and *I. nubila* (Navás, 1933), are known only from their original descriptions, which are generally inadequate.

In this paper, based on our examination of some *Ilyobius* specimens from several historical collections, we provide some new information on this rare alderfly genus, including the re-descriptions of *I. flavicollis* and *I. nubila*, and the description of a new species from Panama and Colombia. The first key to the extant species of *Ilyobius* is also given.

Methods

Specimens for the present study are deposited in the Museum für Naturkunde (MFN), Berlin, Germany; the Warsaw Museum of the Institute of Zoology (MZPW), Polish Academy of Sciences, Warsaw, Poland; the Senckenberg Deutsches Entomologisches Institut (SDEI), Müncheberg, Germany; and the National Museum of Natural History (USNM), Smithsonian Institutions, Washington, D.C., U.S.A. Genitalic preparations were made by clearing the apex of the abdomen in a cold, saturated KOH solution for 8–10 h. After rinsing the KOH with acetic acid and water, the apex of the abdomen was transferred to glycerin for further dissection and examination. After examination it was moved to fresh glycerin and stored in a microvial pinned below the specimen. The terminology of the genitalia follows that of Aspöck and Aspöck (2008).

Taxonomy

Genus *Ilyobius* Enderlein

Ilyobius Enderlein, 1910: 381. Type species: *Sialis flavicollis* Enderlein, 1910: 380, original designation.

Diagnosis. Forewing length ~7.0–17.0 mm in males; ~9.0–19.5 mm in females. Body generally blackish brown, but usually with pale head and prothorax. Head generally orange to reddish brown, sometimes with dark markings on frons and vertex. Antennae pilose, more than half the length of the forewing. Compound eyes strongly prominent. Labrum ~4.0–5.0 times wider than long, lateral margins rounded, front margin slightly emarginated. Prothorax >2.0 times wider than long, pronotum uniformly orange to reddish brown, or blackish brown with pale markings. Forewing ~2.5–3.5 times longer than wide, minutely hirsute, margins pilose; costal area feebly or distinctly dilated proximally, with 5–10 distinct costal crossveins; sc-r present; Rs 2-branched; MA 2-branched; MP 2-branched, anterior branch simple, posterior branch bifurcated; CuA 2-branched, CuP simple; 1A simple, 2A 2-branched, 3A simple; 3 r-rs present. Hindwing ~2.5–3.0 times as long as wide; 2–5 distinct costal crossveins present proximally; sc-r absent; Rs 2-branched; MA

2-branched; MP 2-branched; CuA 2-branched, CuP simple; 1A simple, 2A 2-branched, 3A simple; 3 r-rs present. Male tergite 9 transversely arched; sternite 9 broadly linguulate, posteriorly sometimes with elongate median projection; gonocoxites 9 widely separated from each other, generally short and ovoid, but complicatedly shaped in some species; ectoproct paired, or largely paired but medially connected by feebly sclerotized, narrow region; gonocoxites 11 transversely arched, posteriorly with a pair of median processes (= gonostyli 11), which are variously shaped among species; endophallus internally with blackish thorny setae. Female sternite 7 broad, usually with a tubercular median projection near posterior margin; fused gonocoxites 8 and gonapophyses 8 forming a strongly sclerotized complex; tergite 9 strongly broadened ventrally, separating an independent dorsal region, which is much narrower and extending ventrad; gonocoxites 9 valvate, ovoid, posteriorly bearing rather small gonostyli 9.

Distribution. The extant described species are recorded from Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Panama, Peru, and Venezuela. In addition, an undetermined species was recorded in Ecuador (Contreras-Ramos 2008). Considering fossils, *Ilyobius* might have been distributed in Eurasia based on the two species described from the Eocene Baltic ambers (Wichard 1997, 2002) although their generic placements need further clarification (Liu et al. 2015). Another species from the Miocene Dominican amber (Engel and Grimaldi 2007) indicates the past occurrence of *Ilyobius* in Dominica.

Ilyobius curvata sp. n.

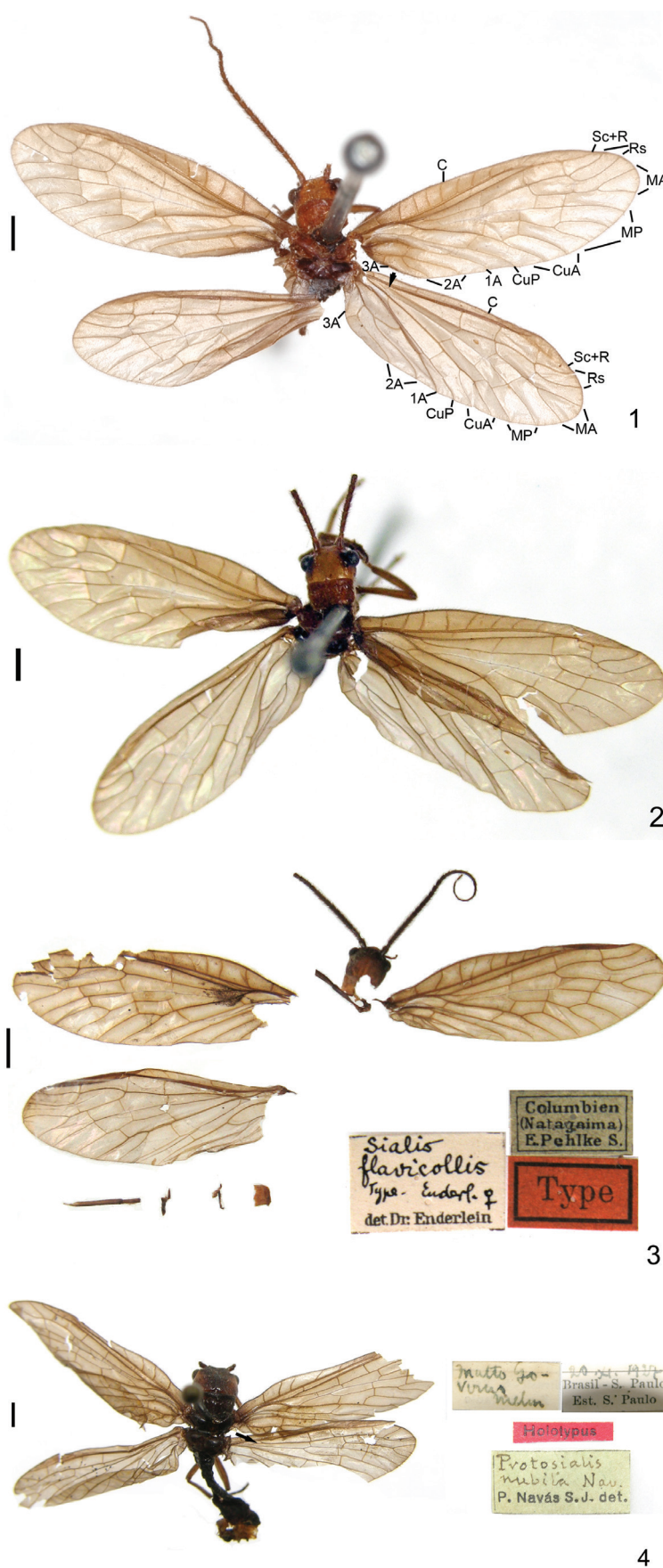
<http://zoobank.org/CB200390-6333-4696-B8EB-47BDBB51535F>

Figs 1–2, 5–11, 15

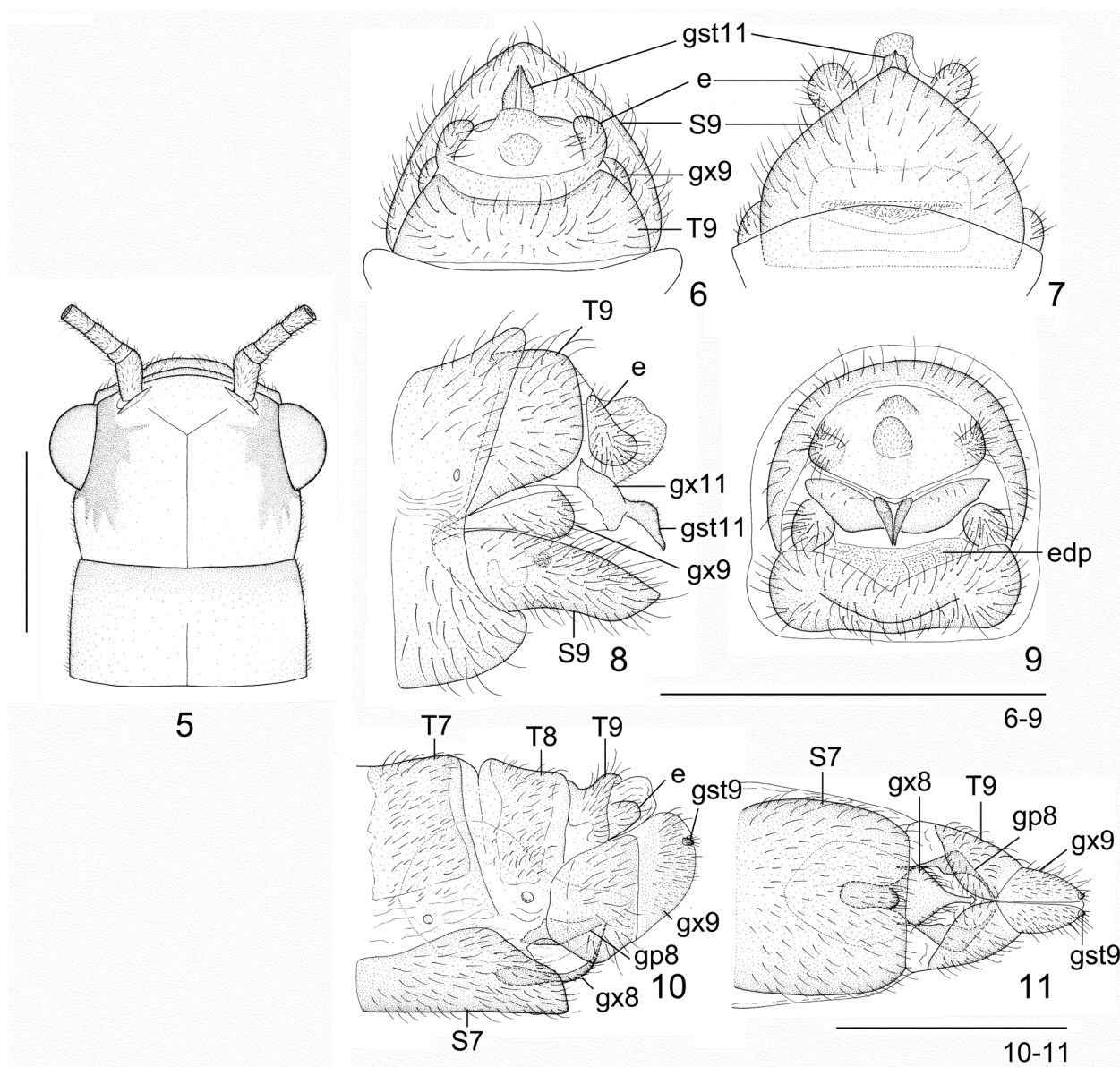
Description. Male. Forewing length 7.0–8.6 mm, hindwing length 5.6–7.8 mm.

Head (Figs 1, 5) smoothly orange, slightly brown on clypeus, with dense short yellowish pilosity; a pair of blackish brown markings present and expanded from entire inner margins of compound eyes, with bifurcate extension medially and trifurcate extension posteriorly; raised scars indistinct. Compound eyes brown. Antennae brown. Mouthparts blackish brown.

Prothorax (Figs 1, 5) brown throughout, pronotum with anterior margin reddish brown; meso- and meta thorax blackish brown. Legs pale brown, bearing dense brownish setae; tarsal claws reddish brown. Wings smoky brown, slightly darker on costal areas and proximal portions; veins pale brown. Forewing about 2.4 times as long as wide; costal area with 13 crossveins (eight proximal ones distinct); sc-r present; Rs with two simple branches; MA with two simple branches; MP proximally fused with CuA, having simple anterior branch and bifurcate posterior branch; CuA bifurcated, CuP simple; 1A simple, 2A with two simple branches, 3A simple; three r-rs present. Hindwing slightly narrower than forewing, about



Figures 1–4. Habitus images of *Ilyobius* spp. 1. *I. curvata* sp. n., male holotype; 2. *I. curvata* sp. n., female paratype; 3. *I. flavicollis* (Enderlein), female holotype and its labels; 4. *I. nubila* (Navás), female holotype and its labels. Arrow indicates the base of hind-wing MA. Scale bars: 1.0 mm.



Figures 5–11. *Ilyobius curvata* sp. n. **5.** Male head and pronotum, dorsal view; **6.** Male genitalia, dorsal view; **7.** Male genitalia, ventral view; **8.** Male genitalia, lateral view; **9.** Male genitalia, caudal view; **10.** Female genitalia, lateral view; **11.** Female genitalia, ventral view. e: ectoproct; edp: endophallus; gp8: gonapophyses 8; gst9 and 11: gonostylus 9 and 11; gx8, 9, and 11: gonocoxite 8, 9 and 11; S7 and 9: sternite 7 and 9; T7–9: tergite 7–9. Scale bars: 1.0 mm.

2.9 times as long as wide; costal area with seven costal crossveins (two proximal ones distinct); branching condition of longitudinal veins mostly same as that of forewing, except for MP having two simple branches; MA proximally leaving a short oblique veinlet fused with MP; M separated from R.

Abdomen blackish brown. Tergite 9 (Fig. 6) in dorsal view nearly 3.0 times as wide as long, anterior margin truncate, posterior margin slightly concaved. Sternite 9 (Fig. 7) lingulate, about twice as long as tergite 9, posteromedially slightly pointed. Gonocoxite 9 (Fig. 8) ovoid, slightly shorter than tergite 9, gradually widened posteriad, with rounded apex. Ectoprocts (Fig. 6) largely paired, ovoid, medially connected by a feebly sclerotized transverse zone. A short ovoid lobe present beneath anus

(Fig. 9). Gonocoxites 11 (Figs 8–9) transversely arched proximally, median processes (= gonostyli 11) close to each other and strongly curved ventrad, with unguiform tips. Endophallus (Figs 7–8) present between tergite and sternite 9, internally with a narrow, transversely band-like, and densely scabrous membrane.

Female. Body length 9.0 mm; forewing length 9.0–9.5 mm, hindwing length 8.4–8.7 mm.

Sternite 7 (Figs 10–11) broad, subtrapezoidal in lateral view and subquadrate in ventral view, with truncate posterior margin and a small tubercular projection subdistad. Fused gonocoxites 8 (Figs 10–11) narrowly elongated, and posteriorly curved dorsad in lateral view; in ventral view nearly rhombic, longitudinally depressed as a canal from a rather narrowed posterior portion to a roundly in-

flated anterior portion, which is inserted beneath sternite 7; gonapophyses 8 (Figs 10–11) distinctly sclerotized, strongly convex posteriad, and widened laterally. Tergite 9 laterally separating into short, narrow dorsal region and broad, subtrapezoidal ventral region. Gonocoxite 9 (Fig. 10) broadly valvate, arcuately margined ventrad, posteriorly with a small gonostylus 9 at tip. Ectoprocts (Fig. 10) short, ovoid.

Type materials. Holotype ♂, “Columbien [= Colombia], Moritz/*ruficeps* Mor[itiz]. i.det. [= identified] Columb[ia]. Mor[itiz].” (MFN). Paratypes 1♀, “Columbien [= Colombia], Moritz” (MFN). 1♀, “Tabernilla [ca. 9°08'N; 79°48'W], Canal Zone, Panama/May 4–07/Collected by August Busck/*Protosialis mexicana* (Bks. [= Banks]) ♀, det. A. Contreras[-Ramos], [20]05” (NMNH); 2♂, Pacora [ca. 9°04'N; 79°17'W], Panama, II-19-[19]45, H.H. Stage/Plot F Sheet, 24 hrs [= hours], 45–4519/*Protosialis mexicana* (Bks. [= Banks]) ♂, A. Contreras-R[amos]., det. 2005” (NMNH).

Distribution. Colombia; Panama (Panama Province).

Etymology. The specific epithet “*curvata*” refers to the strongly ventrally curved median processes (gonostyli) of the male gonocoxites 11 in the new species.

Remarks. The new species is closely related to *Ilyobius mexicana* (Banks, 1901) by having similar cephalic marking patterns and general genitalic characteristics. The three paratypes of the new species from Panama were even identified to be *I. mexicana* by Contreras-Ramos (2008). However, *I. curvata* differs from *I. mexicana* by the male gonocoxites 11 with median processes close to each other and strongly curved ventrad and by the female fused gonocoxites 8 strongly narrowed posteriad. In *I. mexicana* the median processes of male gonocoxites 11 are straightly directed and the female fused gonocoxites 8 is bluntly prominent posteriorly. These genitalic differences are stable based on our examination of several specimens of both species. Moreover, concerning the body-size, *I. curvata* is smaller than *I. mexicana*, with the forewing length less than 9.0 mm in males and 10.0 mm in females, while the forewing length of *I. mexicana* is more than 11.0 mm in males and 12.0 mm in females.

Ilyobius flavicollis (Enderlein)

Figs 3, 15

Sialis flavicollis Enderlein, 1910: 380. Type locality: Colombia (Natagaima).

Re-description. Female. Body length 12.0 mm; forewing length 14.5 mm, hindwing length 13.0 mm.

Head (Fig. 3) blackish brown, but dark orange on median portion of vertex, with dense brownish pilosity; vertex with few raised scars. Compound eyes blackish brown. Antennae blackish brown. Mouthparts brown.

Pronotum (Fig. 3) uniformly orange, other parts of thorax damaged. Only one foreleg preserved, blackish brown, bearing dense brownish setae. Wings smoky

brown, with brownish veins. Forewing about 2.5 times as long as wide, with several transparent patches on proximal costal cells; costal area proximally distinctly dilated, with 10 distinct crossveins; sc-r present; Rs with two simple branches; MA with two simple branches; MP proximally fused with CuA, having simple anterior branch and bifurcate posterior branch; CuA bifurcated, CuP simple; 1A simple, 2A with two simple branches, 3A simple; three r-rs present. Hindwing about 2.5 times as long as wide; costal area proximally with four distinct crossveins; branching condition of longitudinal veins mostly same as that of forewing, except for MP having two simple branches; MA proximally leaving a short oblique veinlet fused with MP; M separated from R.

Abdomen damaged.

Type material. Holotype ♀, “Columbien [= Colombia] (Natagaima [a town of Tolima Department, ca. 3°35'N; 75°05'W]), E[rnst]. Pehlke S./Type/*Sialis flavicollis* Enderl[ein]. ♀, Type, det. Dr. Enderlein” (MZPW).

Distribution. Colombia (Tolima).

Remarks. *Ilyobius flavicollis* is the type species of the genus *Ilyobius*. Unfortunately, the primary type of *I. flavicollis* is largely damaged with the abdomen lost. Nevertheless, *I. flavicollis* is highly possible to be the same genus with the other Neotropical alderflies based on the alternately black-orange body coloration and the wing venations with two simple Rs branches and a bifurcated posterior branch of MP. The cephalic color pattern of *I. flavicollis* is different from all the other *Ilyobius* species, suggesting that this species should be valid.

Ilyobius nubila (Navás)

Figs 4, 12–15

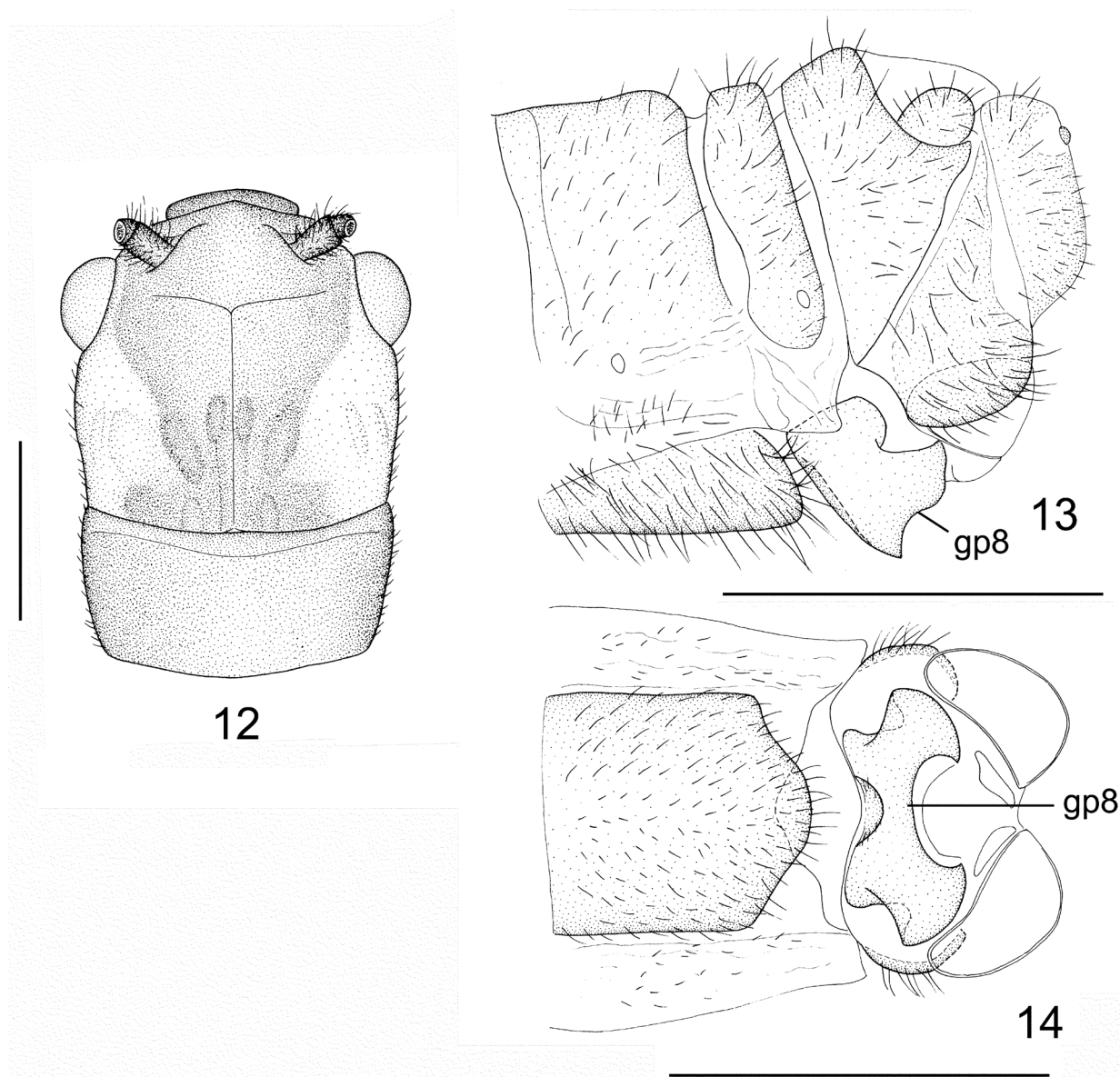
Protosialis nubila Navás, 1933: 36. Type locality: Brazil (São Paulo).

Protosialis brasiliensis Navás, 1936: 725. Type locality: Brazil (São Paulo: Ipiranga).

Re-description. Female. Body length 8.0 mm; forewing length 10.0 mm, hindwing length 8.3 mm.

Head (Figs 4, 12) black, slightly paler around epicranial suture, with dense yellowish pilosity; a pair of dark orange areas posteriorly expanded from entire inner margins of compound eyes; vertex with raised scars. Compound eyes blackish brown. Antennae with scape and pedicel blackish brown, flagellum lost. Mouthparts black.

Thorax (Figs 4, 12) black throughout. Legs yellowish brown, bearing dense brownish setae; tarsal claws reddish brown. Wings smoky brown, with brownish veins. Forewing about 3.5 times as long as wide; costal area proximally distinctly dilated, with five distinct crossveins; sc-r present; Rs with two simple branches; MA with two simple branches; MP proximally fused with CuA, having simple anterior branch and bifurcate posterior branch; CuA bifurcated, CuP simple; 1A simple, 2A with two simple branches, 3A simple; three r-rs present. Hindwing



Figures 12–14. *Ilyobius nubila* (Navás). **12.** Female head and pronotum, dorsal view; **13.** Female genitalia, lateral view; **14.** Female genitalia, ventral view. gp8: gonapophyses 8. Scale bars: 1.0 mm.

slightly broader than forewing, about 3.0 times as long as wide; costal area with two distinct crossveins, branching condition of longitudinal veins mostly same as that of forewing, except for MP having two simple branches; MA proximally leaving a short oblique veinlet fused with MP; M separated from R.

Abdomen black. Sternite 7 (Figs 13–14) broad, with posterior margin roundly prominent medially. Fused gonocoxites 8 (Figs 13–14) rather small, sparsely setose, fused at anterior margin of gonapophyses 8; gonapophyses 8 (Fig. 14) composed of a strongly sclerotized plate, which is ventrally depressed and strongly widened on posterior half, with a broadly arched posterior incision, and a pair of broadly semicircular and a pair of tiny, transparent, membranous plates. Tergite 9 laterally separating into narrowly subtrapezoidal dorsal region and narrowly subtriangular ventral region. Gonocoxite 9 (Fig.

13) broadly valvate, arcuately margined ventrad, posteriorly with a small gonostylus 9 at tip. Ectoprocts (Fig. 13) short, ovoid.

Male. Unknown.

Type material. Holotype ♀, “Malto Go-vuros? [unrecognizable handwritten words], Melzer/Brasil - S[ão]. Paulo, Est[at]. S[ão]. Paulo, 20.XI.1927 [collecting data on opposite side of the label]/*Protosialis nubila* Nav[ás]., P. Navás S.J. det./Holotypus” (SDEI).

Distribution. Brazil (São Paulo).

Remarks. *Protosialis brasiliensis* Navás, 1936 was treated to be a junior synonym of *I. nubila* by Liu et al. (2015), but a re-description and a detailed comparison of these two species was not provided in that paper. The evidence for synonymizing these two species is: 1) the same cephalic color patterns with broad black area approaching the compound eyes, 2) the same black pronotum, 3) the



Figure 15. Distribution map of extant species of *Ilyobius*. Besides the present record, other geographical distribution records were obtained from Flint (1973), Penny (1981), Contreras-Ramos (2006, 2008), and Contreras-Ramos et al. (2005).

same wing shape, which is narrowed with distinctly dilated costal area; 4) the same distribution area. The type locality of *I. nubila* was cited to be in the Mato Grosso State of Brazil (Oswald 2014). This record is actually from a very unclear and unrecognizable handwritten la-

bel of the holotype of *I. nubila*. However, the opposite side of this collecting label includes some printed words “Brasil - S. Paulo, Est. S. Paulo” and a possible collecting date “20.XI.1927”, which have never been mentioned in the original description (Navás 1933). Therefore, we can-

not exclude the possibility that the holotype of *I. nubila* was collected from São Paulo, where this species occurs, based on the distribution record of *P. brasiliensis* (the junior synonym of *I. nubila*).

This species appears to be closely related to another Brazilian species, *Ilyobius hauseri* (Contreras-Ramos, Fiorentin & Urakami, 2005), by having similar cephalic color patterns with a longitudinal median black stripe,

the black pronotum, and the narrow forewings with distinctly dilated costal area. However, *I. nubila* can be distinguished from *I. hauseri* by the broader cephalic black stripe and the posteriorly broadened female gonapophyses 8 with a broad arcuate posterior notch. In *I. hauseri*, the cephalic black stripe is relatively narrow and not approaching the compound eyes, and the female gonapophysis 8 is convex posteriad without any posterior notch.

Key to species of *Ilyobius*

- 1 Pronotum pale, uniformly orange to reddish brown (Fig. 1); female fused gonocoxites 8 well developed, gonapophysis 8 with a narrow, arcuate, posteriorly convex sclerite (Fig. 11) 2
- Pronotum dark, usually black, sometimes with pale markings (Fig. 3); female fused gonocoxites 8 reduced, gonapophysis 8 with a broad, plate-like sclerite (Fig. 14) 7
- 2 Head without posteriorly trifurcate dark marking around compound eyes (Fig. 3) 3
- Head with posteriorly trifurcate dark markings around compound eyes (Fig. 5) 4
- 3 Head blackish brown, but dark orange on median portion of vertex (Fig. 3); **Colombia** *I. flavicollis* (Enderlein)
- Head uniformly orange brown (Contreras-Ramos 2006: fig. 1); **Venezuela** *I. ranchograndis* (Contreras-Ramos)
- 4 Frons with a pair of ovoid black spots between antennal fossae; **Bolivia** *I. bimaculata* (Banks)
- Frons without any dark marking 5
- 5 Male gonocoxite 9 elongate and strongly directed posterodorsad (Contreras-Ramos 2008: fig. 10); male gonocoxites 11 with median processes directed ventrad (Contreras-Ramos 2008: fig. 10); **Brazil** and **Peru** *I. flammata* (Penny)
- Male gonocoxite 9 short, ovoid, not directed posterodorsad (Fig. 8); male gonocoxites 11 with median processes directed posteriad (Fig. 8); **Central America** and **northernmost of South America** 6
- 6 Forewing length more than 11.0 mm in males and 12.0 mm in females; male gonocoxites 11 with median processes straightly directed posteriad (Liu et al. 2015: fig. 14g); female fused gonocoxites 8 bluntly prominent posteriad (Liu et al. 2015: fig. 15d); **Mexico** *I. mexicana* (Banks)
- Forewing length less than 9.0 mm in males and 10.0 mm in females; male gonocoxites 11 with median processes distinctly curved posteroventrad on distal half (Fig. 8); female fused gonocoxites 8 strongly narrowed posteriad (Fig. 11); **Panama** and **Colombia** *I. curvata* sp. n.
- 7 Head orange with three broad black markings on frons and lateral portions of vertex, but middle of vertex without dark marking (Contreras-Ramos 2008: fig. 3); male sternite 9 posteriorly with a long, digitiform, median projection, but without any posterolateral projection (Liu et al. 2015: fig. 14b); **Argentina** and **Chile** *I. chilensis* (McLachlan)
- Head orange with a median black stripe extending from middle of vertex to frons; male sternite 9 posteriorly with a long, digitiform, median projection and a pair of short lateral projections (Contreras-Ramos et al. 2005: fig. 3); **Brazil** 8
- 8 Head with median black stripe anteriorly not approaching compound eyes (Contreras-Ramos et al. 2005: fig. 1); female gonapophysis 8 posteriorly convex (Contreras-Ramos et al. 2005: fig. 6); **Brazil** .. *I. hauseri* (Contreras-Ramos, Fiorentin & Urakami)
- Head with median black stripe anteriorly expanded and approaching compound eyes (Fig. 12); female gonapophysis 8 posteriorly broadly concaved (Fig. 14); **Brazil** *I. nubila* (Navás)

Discussion

Liu et al. (2015) separated *Ilyobius* into two species-groups, i.e., the *I. chilensis* group and the *I. mexicana* group, according to a morphology-based phylogenetic analysis of the world's alderfly species. The *I. chilensis* group is composed of *I. chilensis*, *I. hauseri*, and *I. nubila*, and its monophyly is supported by the male sternite 9 with an elongate median projection, the hook-like male ectoprocts, the transversely band-like male gonocoxite 11 with short median processes, and the female fused gonocoxites 8 reduced and fused with gonapophyses 8 (Liu et al. 2015). Four species, *I. flammata*, *I. flavicollis*, *I. mexicana*, and *I. ranchograndis*, were placed in the *I. mexicana* group, whose synapomorphies are the male ectoprocts largely paired but me-

dially connected by a very thin and feebly sclerotized region, the male anus ventrally with a setose lobe, and the female sternite 7 with a tubercular process near posterior margin (Liu et al. 2015). *Ilyobius bimaculata* and *I. curvata* are herein considered to be members of the *I. mexicana* group based on the similar cephalic marking patterns and genitalia.

The biogeography of Neotropical Megaloptera is poorly known. Some Neotropical genera of Corydalidae were considered to be diverged due to the splitting of Gondwana during Mesozoic (Penny 1993; Contreras-Ramos 1998; Liu et al. 2012). However, the divergence time of *Ilyobius* with its related genera is still unclear, but was estimated to be very early before the splitting of Pangaea in the Mesozoic (Liu et al. 2015). The only published work on speciation and their bio-

geographical correlation of Neotropical Megaloptera refers to Contreras-Ramos (1998), in which however the biogeographical discussion on the dobsonfly genus *Corydalus* is very general. The uplifting of the Andes, the formation of the Amazonian inland sea, and the northward movement of the Paraná biogeographic province were considered to be the major events for the speciation of *Corydalus* (Contreras-Ramos 1998). Considering *Ilyobius*, the Andes might also have been a significant vicariance for some speciation within this genus. For example, *I. chilensis* is restricted to a narrow area eastern to the Southern Andes, while its congeners, i.e. *I. hauseri* and *I. nubila*, are apparently from the western area to the Southern Andes. Moreover, according to the present distribution pattern of *Ilyobius* (Fig. 15), the two species-groups show more or less disjunctive distributions to each other. The *I. chilensis* group is distributed in southern part of South America, while the *I. mexicana* group ranges from central-eastern South America to Central America. The separation between these two species-groups seems to be correlated with the formation of the Brazilian Plateau where *Ilyobius* has not been collected, probably because this genus prefers the tropical or subtropical lowland forests but not the highland habitats. Nevertheless, due to the incomplete knowledge of the distribution of *Ilyobius* and its phylogeny, any biogeographical consideration on this genus is still premature. The faunal exploration and re-description of the species yet poorly known in *Ilyobius* are still important and will be the basis for further phylogenetic and biogeographic studies, which will be helpful to understand the evolutionary history of this interesting group.

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