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Taxonomic and distributional notes on the dobsonflies of Ecuador (Megaloptera: Corydalidae)

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ABSTRACT

A general account of the taxonomy and distribution of the dobsonflies of Ecuador is given, with notes on recently studied material from the Pontificia Universidad Católica del Ecuador. Twelve species are reported from the country and their respective distributions are summarized. Three additional, but undescribed species are apparent in recently examined museum collections. A second male of *Corydalus ecuadorianus* Banks is reported, and photographs of the male and the female holotype are included. The location of syntypes of *Chloronia mirifica* Navás, previously thought destroyed, is established at the Museu de Zoologia, Barcelona, Spain. A lectotype for the latter species is designated.

KEY WORDS: Megaloptera, Corydalidae, Ecuador, taxonomy, *Chloronia mirifica*, lectotype

RESUMEN

La taxonomía y distribución de los coridálidos de Ecuador son consideradas de manera general, con notas sobre material de la Pontificia Universidad Católica del Ecuador estudiado recientemente. Doce especies son reportadas de ese país y sus respectivas distribuciones son sintetizadas. Tres especies más, no descritas, son aparentes de acuerdo a ejemplares de museo recientemente examinados. Se reporta un segundo macho de *Corydalus ecuadorianus* Banks, incluyéndose fotografías del macho y del holotipo hembra. La localización de los sintipos de *Chloronia mirifica* Navás, previamente considerados como destruidos, es establecida en el Museu de Zoologia, Barcelona, España. Se designa un lectotipo para esta última especie.

PALABRAS CLAVE: Megaloptera, Corydalidae, Ecuador, taxonomía, *Chloronia mirifica*, lectotipo.

A recently examined collection of dobsonflies from the Museo de Zoología of the Pontificia Universidad Católica del Ecuador (QCAZ) produced several interesting specimens, among them the second known male of *Corydalus ecuadorianus* Banks. Several new distribution records for Ecuadorian dobsonflies were also found. These interesting records are presented here in addition to other taxonomic annotations.

The known fauna of Megaloptera from Ecuador is listed in Table 1. It consists of 12 described dobsonfly species (Corydalidae: Corydalinae), three in *Chloronia* Banks and nine

in *Corydalus* Latreille. At least three apparently undescribed *Corydalus* species have been detected on the basis of female specimens (two previously and one in this paper). There are no records of alderflies (Sialidae) in Ecuador, but the family might be present there, as it has been recorded from adjacent Colombia and further south in Bolivia. Such interesting distributional patterns clearly indicate that further collecting and phylogenetic analyses are necessary to fully address the dobsonfly fauna of the region. Species identifications presented here are based on the works of Penny and Flint (1982) and Contreras-Ramos (1995, 1998). All specimens listed within material studied belong to QCAZ, except where noted.

Chloronia bogotana Weele

Chloronia bogotana Weele, 1909: 253

One specimen (from Zamora-Chinchipe Province, sex undetermined) was proposed by Flint (1991) as an example of this species. Upon further analysis, Contreras-Ramos (in press) has proposed a more restricted description of *C. bogotana* on the basis of a new series of specimens from Colombia. Male specimens from the collecting site (8 km NW Zamora, mouth Rio Sabanilla, 1420 m) may prove the existence of an undescribed species.

Chloronia convergens Contreras-Ramos

Chloronia convergens Contreras-Ramos, 1995: 109

This species is known only from two male specimens recorded in the original description, both from Pichincha Province. The collecting sites, Santo Domingo de los Colorados and Puerto Quito, are on lowlands (about 500 m or less) west from Quito, suggesting this species is distributed along western slopes of the Andes.

Chloronia mirifica Navás

Figs. 1–4

Chloronia mirifica Navás, 1925: 195

This widespread species is known from southeastern Mexico (Oaxaca, Veracruz) southward through Central America (Guatemala, Costa Rica, Panama), and South America (Colombia, Ecuador, and Peru) (Penny and Flint, 1982; Contreras-Ramos, 1999). Records of this species in Ecuador are scarce. In Penny and Flint's revision only one record from Sliquino (Ecuador "Or[iental]") is given, from the holotype of *C. hieratica* Navás, a junior synonym of *C. mirifica*. A few records from Napo and Pichincha are given by Contreras-Ramos (1995). Additional records are given below.

Penny and Flint (1982) specified antennae of *C. mirifica* as having 36-55 flagellomeres. However, the male from Santo Domingo de los Colorados has long antennae (66 segments).

Also, a tuft of long preapical setae on the ninth gonostylus, is quite similar to males of *Chloronia marthae* Contreras-Ramos (2002) from Venezuela. Mexican specimens of *C. mirifica* lacked a discrete tuft of setae. Moreover, the type of *C. hieratica* appears to be a long-antennae male. Therefore the possibility exists, at least, for: 1) *C. marthae* to occur in Ecuador; 2) *C. hieratica* be a senior synonym of *C. marthae* (the "long antennae form"); or 3) *C. marthae* be a junior synonym of *C. mirifica* (together with *C. hieratica*, as it is now recognized), a widespread and variable species. Specimens collected from throughout the range of this species will be necessary to clarify these questions. However, the current taxonomy remains unchanged (i.e., *C. mirifica* is a senior synonym of *C. hieratica*, and *C. marthae* is a distinct species).

During a visit in 1993 to the Museu de Zoologia of the Ajuntament de Barcelona (MZBS) to study types from the Navás Collection, two syntypes of *Chloronia mirifica* from Costa Rica were found. The syntypic series (Figs, 1–4) consists of a male specimen missing its *terminalia*, from Peralta, and a female specimen from Zarcas ("Aguas Zarcas" according to Penny and Flint, 1982: 11). Penny and Flint (1982), in their revision of the genus *Chloronia*, assumed that these types were lost and they subsequently designated a neotype from Costa Rica. For the sake of clarity, the existence of Navás' original syntypes is now disclosed and a lectotype is designated. The neotype designation is thus nullified on the basis of article 75.8 of the ICZN (1999).

Material studied: LECTOTYPE (herein designated): ♂, COSTA RICA: Peralta, 21.vi.[19]21, [wingspan = 74.45 mm] (MZBS). PARALECTOTYPES: COSTA RICA: Zarcas, 30.iii.[19]23, 1♀ [wingspan = 76.5 mm] (MZBS).

Additional specimens: ECUADOR: Esmeraldas: San F[rancis]co, ?m [unreadable], 10.i.[19]96, 1♀ ; Napo: Vía Lumbaquí, La Bonita, 25.v.2000, G. Onore, 1♀; Pichincha: Sto. Domingo de los Colorados, Piña, 18.iii.1996, G. Onore, 1♂; Sucumbíos: Lumbaquí, 00˚ 02' 48" N, 77˚ 18' 42"W, 600 m, 08.v.1999, C. Rivadeneira, A. Coloma, 1♀.

Chloronia sp.

A single female with head markings quite similar to *Chloronia bogotana* (Contreras-Ramos, in press, figs. 7–8) was examined from the QCAZ collection. Dark spots on the base of foretibiae are also present. This unusual specimen may represent an undescribed species. However, until male specimens are collected, the identity of this species remains unknown.

Material studied: ECUADOR: Napo: SC Station Yasuni, PUCE, 400 m, 27.xi.1995, I. Tapia, 1♀.

Corydalus affinis Burmeister

Corydalis affinis Burmeister, 1839: 951

This is a widespread South American species occurring mostly in the Amazonian lowlands. It has been recorded from Argentina, Bolivia, Brazil, Colombia, French Guiana, Guyana, Paraguay, Peru, and Venezuela. There are only a few records of this species from Ecuador (Contreras-Ramos, 1998), including Napo, Pichincha, and Sucumbíos provinces. In the QCAZ series, there are two specimens from Sucumbíos and 26 specimens from Napo, all from previously unrecorded localities. As observed for other *Corydalus* species, *C. affinis* exhibits a great deal of size variation. In the specimens studied male forewing length ranges from 32–45 mm (n = 6), whereas in females it ranges from 39–58 mm (n = 22).

Material studied: ECUADOR: Napo: SC Station Yasuní, PUCE, 400 m, 11-23.ix.1995, E. Baquero, F. Maza, 2♂, 8♀; same but 27.xi.1995, I. Tapia, 5♀; Estación Científica Yasuní, 600 m, 0˚ 40' S, 76˚ 24' W, 04.ii.1997, Z. Aguilar, 1♂; SC Yasuní, 250 m, 15-17.xi.1996, M. Morales, L. Salazar, 1♀; same but 01-08.iii.1997, I. Tapia, 1♀; same but 09-13.iii.1997, M. Mancero, 1♂; same but 01.iv.1997, G. Onore, 2♂; same but 07.ix.1997, F. Maza, 1♀, ex. Light trap; same but 8.ix.1997, F. Maza, 1♀, ex light trap; E. C. Yasuní, 250 m, 06.iii.1998, G. Onore, 1♀; E. C. Yasuní, 230 m, 00˚ 40' S, 76˚ 24' W, 24.xii.1997, E. Baus, 1♀; E. C. Yasuní, 350 m, 00˚ 38' S, 76˚ 30' W, 05.x.1998, J. R. Hidalgo, 1♀; Sucumbíos: P. N. Yasuní, 230 m, 0˚ 40' S, 76˚ 24' W, v.1997, J. Santiana, 1♀.

Corydalus armatus Hagen

Corydalis armata Hagen, 1861: 321

This is the sister species of *C. peruvianus* Davis. Both are quite similar, however males are easily separated on the basis of antennae color. In *C. armatus*, antennae are brown and uniformly colored with respect to head, whereas in *C. peruvianus*, the antennae, including scape, are pale yellow. Other diagnostic characters are given in Contreras-Ramos (1998). Unfortunately, females of these two species are quite difficult to distinguish from each other, and often times only males constitute valid records.

There are numerous records of *C. armatus*, from Argentina, Bolivia, Colombia, Peru, and Venezuela (Contreras-Ramos, 1998). In Ecuador, it has been recorded from the provinces of Bolívar, Chimborazo, El Oro, Esmeraldas, Imbabura, Loja, Los Ríos, Napo, Pichincha, Tungurahua, and Zamora Chinchipe (Contreras-Ramos, 1999). Contreras-Ramos (1998) considered *C. armatus* to be a mostly montane species that was found at locations from mid to high elevation. Nineteen elevation records from Ecuador showed range from 250 to 2,300 m, but most of them (n = 16) were from between 500 and 1830 m.

Material studied (selected): ECUADOR: Imbabura: Salinas, 20.ii.[19]94, L. Coloma, 1♂; Junín La Mina, 14-22.ix.1995, A. Endara, 1♂; Pichincha: La Armenia, 00˚ 04' 30" N, 78˚ 41' 06" W, 1800 m, v.1997, H. Mogollón, 1♀.

Corydalus batesii MacLachlan

Corydalis batesii MacLachlan, 1868: 232

This widespread species occurs primarily in the Amazon region. It has been recorded from Bolivia, Brazil, Colombia, French Guiana, Peru, Suriname, and Venezuela. Contreras-Ramos (1998) reported only two records of *C. batesii* from Sucumbíos Province (misplaced within Napo Province) each based on a female specimen. A third female specimen now adds a new occurrence record from Napo Province. All Ecuadorian records are from lowlands and occur close to large rivers.

Material studied: ECUADOR: Napo: Jatún Sacha [Biological Station], 11.viii.1994, Ohio University, 1♀.

Corydalus clauseni Contreras-Ramos

Corydalus clauseni Contreras-Ramos, 1998: 75

This species is known primarily from central and southwestern Ecuador where it occurs in western drainages, but there are a few records from lowland tropical forests in Colombia and Costa Rica. Contreras-Ramos (1998) gave accounts of this species occurring in tropical wet forests, as well as premontane forests with dense "neblinas" at low elevations. However, one record from Pichincha Province (Tandapi) is from an elevation of 1,460 m. No specimens of this species were examined for this paper.

Corydalus ecuadorianus Banks

Figs. 5–6

Corydalus ecuadorianus Banks, 1948: 82

This species was previously known only from the female holotype (Fig. 5) and a male preserved at a teneral stage (Contreras-Ramos, 1998, fig. 88). In the QCAZ collection, there is an additional male (Fig. 6) which displays a fully developed color pattern conforming well to the holotype, and the genitalia of this specimen corresponds quite well with the description in Contreras-Ramos (1998). The new record is from between Quito and Nanegalito, a town about 35 kilometers northwest of the capital city. All three known specimens of this species were collected from the mountain ranges of central Ecuador.

Material studied: ECUADOR: Pichincha: Vía Nanegalito, 1500 m, 21.i.1994, P. Sancho, 1♂.

Corydalus flavicornis Stitz

Corydalus armatus flavicornis Stitz, 1914: 195

This is a Central American and western South American species that is fairly common in collections. It has been recorded from Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Panama, Peru, and Venezuela. In Ecuador (Contreras-Ramos, 1998, 1999), there are several records from the provinces of Guayas, Esmeraldas, Loja, Los Ríos, Napo, Pastaza, Pichincha, and Tungurahua, along both sides of the mountain ranges. Collecting records show that this species strongly favors low to midelevations up to 800 m. In Ecuador, recorded elevations are from 700 m or less. The QCAZ collection yielded two male and four female specimens, but from only three unreported localities.

Material studied (selected).— ECUADOR: Manabí: El Carmen, 600 m, 25.xii.1993, T. Villegas, 1♂; Napo: Coca Palmoriente, v.1987, E. Martínez, 1♀; Pichincha: Alluriquín, 0° 19' S, 78° 59' W, 700 m, 30.iv.1997, M. Avila, 1♂; same but F. Sáenz [collector], 1♀.

Corydalus longicornis Contreras-Ramos

Corydalus longicornis Contreras-Ramos, 1998: 123.

This species is known only from six male specimens from the Andean region of Argentina and Bolivia, as well as one male from Ecuador. Specimens have been collected at elevations ranging from 1,010 to 1,300 m (n = 5), although one record is from 500 m (Contreras-Ramos, 1998). The only record for Ecuador was collected from the Zamora Chinchipe Province (Cordillera del Cóndor, 21 km SE Paquisha, 1,010 m), close to the Peruvian border. Additional collections of this species would allow insight into the morphological variation observed for the existing specimens. Females of this species remain unknown.

Corydalus parvus Stitz

Corydalus parvus Stitz, 1914: 196.

Corydalus parvus is known from 12 specimens collected in Peru and two additional specimens from Ecuador where it has an Andean distribution. Contreras-Ramos (1998), recorded this species at elevations ranging from 610 to 1,500 m (n = 6), but most of them (five) were from less than 1,000 m. In Ecuador, collection records are from the provinces of Pastaza (Puyo, 610-762 m) and Zamora Chinchipe (6 km E Zumba, 980 m).

Corydalus peruvianus Davis

Corydalis peruviana Davis, 1903: 480.

There are many records of *C. peruvianus*, from Argentina, Bolivia, Colombia, Costa Rica, Guatemala, Mexico, Panama, Peru, and Venezuela. In Ecuador (Contreras-Ramos, 1999), it has been recorded from the provinces of Cotopaxi, Guayas, Los Ríos, Morona Santiago, Napo, Pastaza, Pichincha, and Sucumbíos. Seven elevation records from Ecuador (Contreras-Ramos, 1998) ranged from 15 to 1150 m, but most of them (n = 5) are from between 870 and 1150 m. Contreras-Ramos (1998) indicated that *C. peruvianus* is perhaps one of the most widespread corydalid species in South America, with 48 elevation records below 1,000 m, 28 records between 1,000 and 2,700 m, and only one record above 1,600 m. The record from Imbabura in the QCAZ collection represents a new province record for Ecuador.

Material studied (selected).— ECUADOR: Cotopaxi, La Maná Guasaganda, 500 m, 4.i.1995, A. Barragán, 1♂; Imbabura: Lita, 506 m, 21.x.1997, G. Onore, F. Maza, 1♂, ex. light trap; Napo: Río Hollin, 00˚ 41' S, 77˚ 43' W, 1125 m, 5.xii.1998, P. Carrera, 4♂; Sucumbíos: San Rafael, 1400 m, i.1994, G. Onore, 1♂.

Corydalus spp.

Contreras-Ramos (1998) indicated that two female specimens collected from Ecuador represented possible new species. *Corydalus* species 4 (near *C. tesselatus* Stitz), was collected from Sucumbíos Province (El Reventador), and *Corydalus* species 5 (near *C. colombianus* Contreras-Ramos) was collected from Pichincha Province (Palmeras). In the QCAZ collection, there is a female of *Corydalus* species 4 (also from El reventador) and two female specimens of a possible third new species (*Corydalus* species 6), also similar to *C. tesselatus*, from Napo Province. The latter specimens have a color pattern with wider pale areas with respect to *Corydalus* species 4, but they have a double pterostigmatic area on the forewings and a well sclerotized eighth abdominal sternum (as in *C. tesselatus* and *Corydalus* species 4). However, males of each of these possible undescribed species must be collected and evaluated before a decision can be made on the status of these species.

Material studied: ECUADOR: Napo: Lumbaquí, 00˚ 00' S, 77˚ 21' W, 500 m, 7.v.[19]99, M. Arévalo, 1♀ [*Corydalus* species 6]; Cascadas San Rafael, 00˚ 04' 44" S, 77˚ 33' 30" W, 1400 m, 27.v.2000, A. Iglesias, 1♀ [*Corydalus* species 6]; Sucumbíos: El Reventador, 1485 m, 19.xi.1993, D. Padilla, 1♀ [*Corydalus* species 4].

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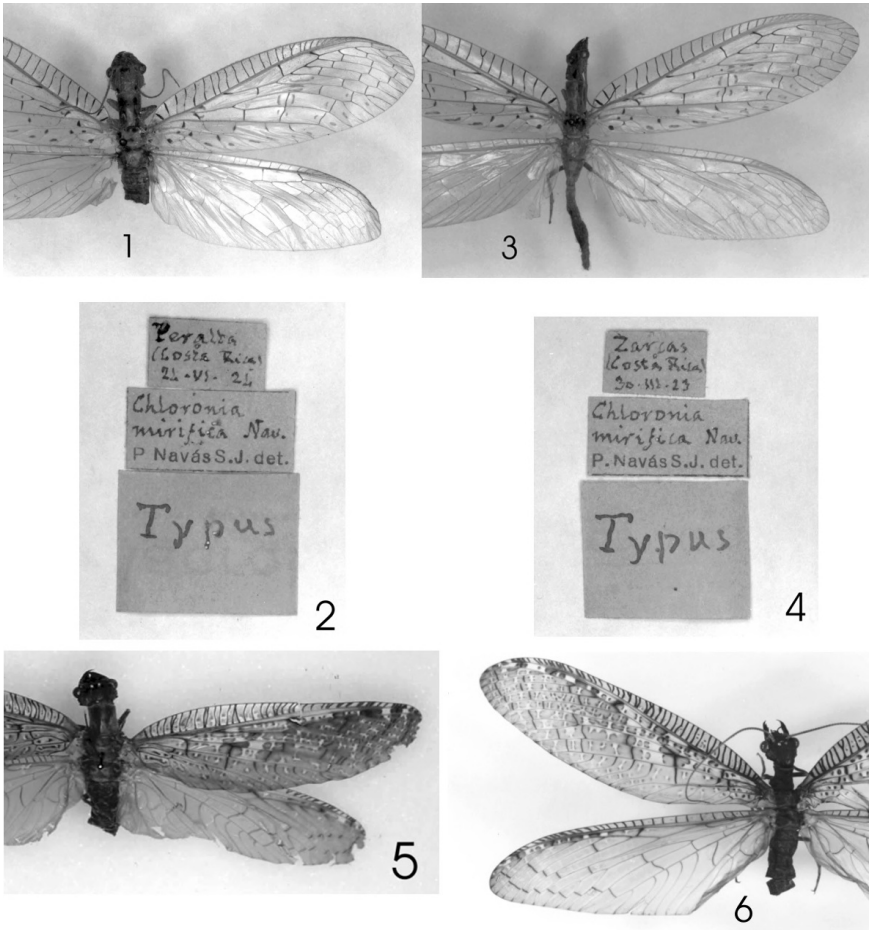
Table 1. Known fauna of Megaloptera from Ecuador.

Taxon	Comments	Selected references
Chloronia bogotana Weele	One specimen (prob. ♀) recorded from Zamora-Chinchipe Province, Ecuador; most likely not *C. bogotana*	Flint (1991), Contreras-Ramos (in press)
C. convergens Contreras-Ramos	Known only from Pichincha Province, Ecuador	Contreras-Ramos (1995)
C. mirifica Navás	Commonly collected species, widespread from Mexico through Peru	Penny and Flint (1982), Contreras-Ramos (1995)
Corydalus affinis Burmeister	Widespread lowland South American species, known from Napo, Pichincha, and Sucumbíos provinces in Ecuador	Contreras-Ramos (1998)
C. armatus Hagen	Widespread Andean South American species; many records from Ecuador	Contreras-Ramos (1998)
C. batesii MacLachlan	A fairly widespread mostly Amazonian species; very few records from Ecuador	Contreras-Ramos (1998)
C. clauseni Contreras-Ramos	Known from Colombia and Costa Rica also, but most records are from Ecuador	Contreras-Ramos (1998)
C. ecuadorianus Banks	Known only from Ecuador; scarce records	Contreras-Ramos (1998)
C. flavicornis Stitz	Central American and western South American species; many records from Ecuador	Contreras-Ramos (1998)
C. longicornis Contreras-Ramos	Known from a few records on the Andes mountains of Bolivia, northwestern Argentina, and Ecuador; only one specimen recorded from Ecuador (Zamora-Chinchipe Province)	Contreras-Ramos (1998)
C. parvus Stitz	Known only from several records on the Andes mountains of Peru and Ecuador; only two specimens recorded from from Ecuador	Contreras-Ramos (1998)
C. peruvianus Davis	Widespread species, from southeastern Mexico and Central America through northern Argentina	Contreras-Ramos (1998)
C. spp. 4 and 5	Undescribed species; males unknown	Contreras-Ramos (1998)



Figures. 1–4. *Chloronia mirifica* Navás original syntypes. 1) Male lectotype (abdomen missing), 2) Lectotype original labels, 3) Female paralectotype, 4) Paralectotype labels. Figures. 5–6. *Corydalus ecuadorianus* Banks. 5) Female holotype, 6) Second known male.